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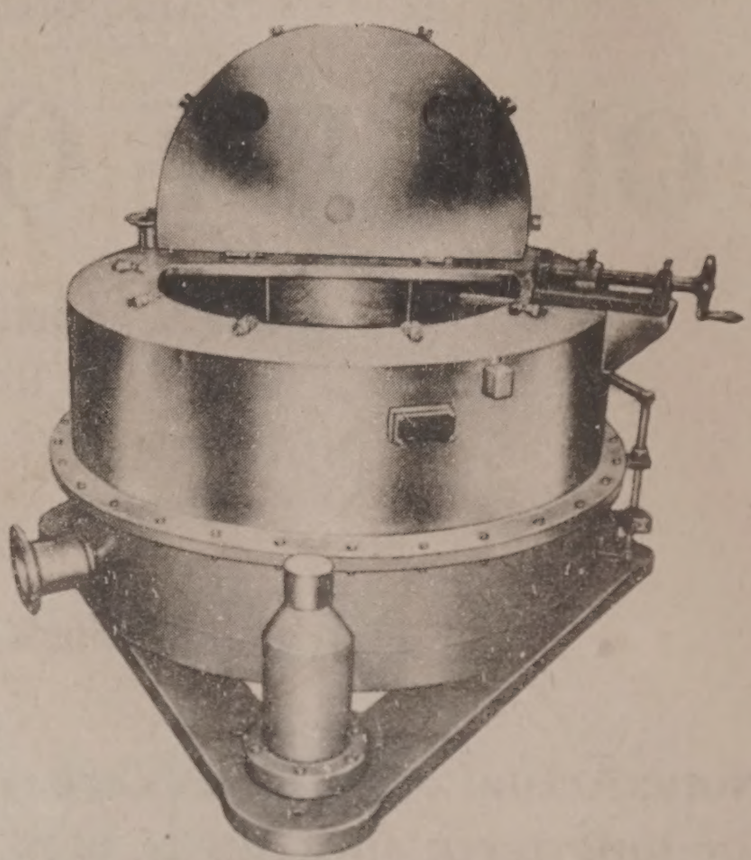

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CHEMICAL WEEKLY

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HERALDING THE 21st CENTURY - 27

Transportation Tomorrow

Americans retain the highest degree of invidual mobility in the world. Worries about escalating gas prices and future fuel availability seemed to subside in the 1980s almost as quickly as they had emerged about a decade earlier. Motor vehicles are a major source of the air pollution that plagues cities around the world and takes an uncounted toll on human health. Pollutants from cars also contribute to the formation of acid rain and to global warming.

The auto culture is so deeply ingrained in Western Society that alternatives to it seem virtually unthinkable. But excessive reliance on cars can actually stifle rather than advance societies. The automobile exacts an enormous toll in human life. Despite safety improvements, more than 200,000 people died in traffic accidents around the world in 1985, with millions more suffering injuries of varying severity. In several developing countries, where fatalities per mile travelled are often 20 times higher than in industrial lands, traffic accidents are now a leading cause of death.

Large stretches of land have been given over to the automobile and its infrastructure. Parking a car at home, the office, and the shopping mall requires an average 4,000 square feet of asphalt. Over 60,000 square miles of land in the United States have been paved over. That works out to about 2% of the total surface area, and to 10% of all arable land. Worldwide, at least a third of an average city's land is devoted to roads, parking lots, and other elements of a car's infrastructure. In American cities, close to half of all the urban space goes to accommodate the automobile; in Los Angeles, the figure reaches two-thirds.

Average car-travel speeds are reportedly as low as eight miles per hour (mph) in London, and even less in Tokyo. The conventional approach to the congestion problem has led to a vicious circles; building more roads simply attracts more cars, thus increasing the pressure for still more roads. In South California, where there are probably more miles of freeways than anywhere else in the world and where daily commuting of 40 miles are not uncommon, the average travel speed is no higher than 33 mph. It is expected to drop to 15 mph by the year 2000, as population and car ownership continue to grow rapidly.

Congestion is more than annoyance. The U.S. Department of Transportation estimated that, due to congestion, nearly 3 billion gallons of oil were wasted in the United States in 1984, accounting for roughly 4% of the nation's annual gasoline consumption. The Department projects that over 7 billion gallons of fuel will be wasted per year by 2005 on highways alone, assuming no additional road construction. Most North American and Australian cities bear the imprint of the automobile system.

Public transportation systems offer a host of advantages over automobiles. When fully used, they are considerably more energy efficient and less polluting. In addition, public mass transit reduces congestion. A car requires roughly nine times more road space per passenger than a bus. Running on tracks or lanes separate from cars, rail systems and buses can provide rapid transit. Despite high levels of car ownership, Western Europe has always boasted an extensive and reliable network of public mass-transit systems -- buses, streetcars, subways and railroads. In the United States, by contrast, public transportation plays a marginal role.

A subway system may be preferable where the right-of-way above ground is not available or where urban densities make ground transportation impractical. Subways usually have the greatest capacity to transport large numbers of passengers at high speed. But "light rail" systems are considerably cheaper to construct than underground metros. Buses are by far the cheapest mode of public transportation, but they pollute more and, unless separate express lanes are established, they get caught up in road congestion. In interurban and rural transportation, European rail systems have demonstrated efficiency, speed and convenience that rival the automobile.

Third World cities stand at the crossroads as they swell in size and as urban transportation needs rapidly multiply. In view of Michael Replogle of the Institute for Transportation and Development Policy, "There is a growing transportation crisis in many lesser-developed countries. This crisis is the product of ..... a mis-match between the supply of transportation infrastructure, services, and technologies and the mobility needs of the majority of Third World people".

Existing public transportation -- most commonly bus systems -- often is in poor repair and has failed to keep up with urban population growth. In India and Bangladesh, for example, the urban public-transit sector may meet as little as 15% of transportation needs. Yet, the urban poor spend a disproportionate share of their incomes on transport. In New Delhi, the lowest income groups devote

20-25% of their house-hold incomes to transport, while the wealthiest group spends only 8%. And often the poor cannot afford public transportation at all. Third World cities such as Jakarta and Manila have imposed constraints on non-motorized forms of travel; others, such as Singapore and Caracas, provide insufficient sidewalk space.

Subway systems once were regarded as ideal solutions for burgeoning Third World cities because of their ability to move large numbers of passengers at high speed. But the heavy initial investment is beyond the financial capabilities of most urban governments. Fares have to be high enough to cover capital and operating costs -- too high to attract enough riders -- or subsidies need to be astronomically high. Calcutta and Cairo recently completed such subway systems, but many other municipalities have been forced to indefinitely postpone construction of planned systems. In Asia, human-powered rickshaws, pedicabs (motorcycle-driven rickshaws), bicycles, pushcarts, and tongas (animal-drawn carts) fill the gap left by inadequate public transportation. Engineering improvements can make them more efficient.

Bicycles -- considered mainly a recreational device in the United States -- are the predominant means of short-distance urban vehicular transportation in Asia, although they are far less common in parts of western hemisphere and Africa. An average bicycle requires only 2% of the capital necessary to own and operate a car. India has approximately 25 times as many bicycles as motor vehicles. In China, rising per capita incomes have triggered a bicycle boom; there is now one bicycle for every four people, and in cities, one for every two. This impressive increase in bicycles has not yet received as much attention as the much smaller rise in car ownership.

The potential of the automobile is far from exhausted. Imaginative design programmes promise much for the future. The thrust of demand today is towards high performance engines with good response that are nonetheless compact, lightweight and superior in fuel economy. Japan's automotive engine technology is well suited to meeting this difficult demand. The design of automotive engines in the near future will move towards small displacement and high power. It seems possible that 2,000 cc displacement will be sufficient in the future, even for large sedans. Engines are becoming smaller. What about bodies? The mass market for automobiles, is one that demands low-priced cars that basically provide three functions: running, turning and stopping.

First, brakes that prevent skidding have been developed and marketed. These antiskid brakes improve safety during high-speed driving and driving on wet or snowy roads. Another development now pursued by automakers in active competition is four-wheel steering. Movement of the steering wheel causes all four wheels to turn in such a way as to maximise the vehicle's stability during its change of course. This is a great step forward in safety at high speeds and in driving in rain or snow.

The future of motorisation is not a matter of automobiles alone. Communication, for example, is another important element. Information channels will be maintained with moving vehicles. Information ranging from traffic conditions to general news and financial data will be obtainable while one is driving. In a rich variety, that only makes the automobile another office for its owner.

In the past century, only two types of internal combustion engines have found practical use in motor vehicles; the gasoline engine and the diesel engine. But a new age of power technology is in sight. An experimental vehicle powered by a gas turbine was developed in the U.S. as early as 1974, and in Japan a bus fitted with a gas turbine has been produced for trials. Meanwhile, research is moving ahead to make the Stirling engine -- a heat regenerating external-combustion engine that operates by high-temperature gas expansion -- practical for automotive use. Vehicle styling will be influenced more strongly by considerations of safety, fuel conservation and pollution control. Sleek, streamlined car bodies will most probably become the rule. In large cities and other areas where it is important to reduce or avoid air pollution, electric automobiles powered by solar cells are sure to enter practical use.

Hydrogen scores well in these regards but fares badly on the priority list of governments and private corporations. In the future hydrogen may become a widely used fuel, in either liquid or compressed gaseous form. A number of new technologies to produce hydrogen are under investigation for example, construction is scheduled to begin late in 1988 on the world's first experimental solar-hydrogen plant in Bavaria, West Germany. Cost is still a major impediment to commercialization, however, and vehicle technology has not yet advanced beyond the prototype stage.

Canada, Japan, and West Germany have made major commitments to promote hydrogen research and development. In the United States, however, hydrogen has yet to attract research and development funding commensurate with its enormous potential. A full accounting of the manifold subsidies the automobile receives, plus the environmental and health costs it entails, might cool the passion felt for cars. In most if not all countries, car owners do not bear the full costs of road building and maintenance, municipal services rendered (such as traffic regulation and costs borne by police and fire department), accidents and related health care, and tax losses from land paved over for automotive purposes.

In the United States, total subsidies may surpass $300 billion each year -- an amount equal to all personal auto-related expenditures. A preliminary, conservative estimate puts the subsidy at some $2,400 for every passenger car. If these expenses were reflected in retail fuel prices, a gallon of gasoline might cost as much as $4.50. Furthermore, other, less quantifiable environmental costs of the auto system are dis-regarded in conventional analyses as mere "externalities". An environmental tax, assessed either on automobiles or fuels, would help internalize these costs. No doubt political opposition to such measures would be enormous. But societies cannot continue to ignore the true costs of the automobile system.

Transport and land use change slowly but shape our societies in a profound manner. Planning in these vital areas has to become far better integrated and coordinated to reduce the need for individual motorized transportation. Societies have yet to come to terms with the multiple effects that mass motorization has wrought. But the social, economic and environmental costs can no longer simply be ignored. They are solid reasons to rethink the role the automobile plays.

-- T.P.S. RAJAN

(Condensed from an article by Michael Renner in the *Futurist*, March/April 1989).

CHEMARENA

S.L. VENKITESWARAN

Megaproject mania

A write-up in *Economic Times* of 15th September is entitled megamania and deals with the spate of projects of the order of thousand crores each and the mad race to mop up funds from the public in issues of shares and debentures at high premia -- an estimated Rs. 4,000 crores in the course of three months. There is a certain element of gullibility in a section of the investing public created and fostered by high profile advertisements in the media including TV. The premia collected is shown as an interest free deposit with the company which may be in no hurry to get on with its megabucks projects and is in no worse a position. The mopped up cash cuts into the investments which could have served more immediate needs in deserving projects which could suffer for lack of funds. There is probably a lot of optimism, part of it misplaced and the capital needs or profitability are not properly evaluated. There is hardly any mechanism of verification nor adequate scrutiny by the capital issues control authority --in the cause of liberalisation of policies. This is an overall picture, but the objective here is to look at the **mega-mania in petrochemicals** and allied areas.

We have had a spate of announcements of large projects in petrochemicals in the recent weeks -- whether finally cleared from all angles or otherwise. Let us first look at projects which are under various stages of implementation before looking at the new hopefuls.

The most advanced new project nearing completion is the Maharashtra Gas Cracker Complex of nearly Rs. 1,500 crores which is implemented by I.P.C.L., the public sector company which is the dominant force in plastics and a wide range of petrochemicals including synthetic rubber and acrylic fibre today. The base is ethane condensed out of the gas which after the removal of condensates (and their fractionation) goes as feed to fertilizer and power projects. The MGCC cracker will draw on some liquiefied gases of refineries to get more propylene and olefins. Capacity is expected to be 350,000 tonnes, most of it going for various grades of polyolefines and for ethylene oxide with some quantities of olefines for sale to others.

The next mega project is of Reliance Petrochemicals (the trend setter in mega issues) which is located at Hazira in Gujarat where again the ethane/propane from off shore gas will be the feed and residual dry gas fed into the H.B.J. pipeline for fertiliser and power projects, some of which are already in production. Reliance Industries had approvals for MEG in Maharashtra but got this also transferred to Reliance Petrochemicals at Hazira in Gujarat where ethylene will be made. The initial concept of a cracker with products by more than one party was given up and the entire complex of olefins and downstream products will be by Reliance Petrochemicals. The RIL programme includes besides MEG, PVC alongwith caustic soda, chlorine, polypropylene, LLDPE, acrylonitrile, styrene, polystyrene and butyl rubber. Pending the completion of the cracker, RIL will import ethylene/propylene in bulk at a port installation near Hazira. The latest additions is that of a PTA plant on 100% (?) export oriented basis using paraxylene imported. The latest estimate of investments is Rs. 3,700 crores(!) and will make Reliance Petrochemicals a match for IPCL + MGCC.

In the field of aromatics and derivatives, two major programmes for paraxylenes and PTA together with coproduct benzene/toluene and oxylene are approved -- one at the Madras Refineries and the other at Salimpur near Mathura Refinery. Each of these may end up as a thousand crore investment. A programme to extend the BPCL aromatics plant to include xylenes seems to have run into trouble and this section may be added to the Reliance Industries at Patalganga where they make PTA and are said to have facilities for xylenes also. There are three producers of LAB for detergents now meeting our requirements in full but two more may be added. Also a project for alpha olefins based on vegetable oils developed in India. There are several phthalic anhydride plants and these may expand to 15,000 TPA in due course for which clearances are automatic. We have two cumene/phenol/acetone plants and one isopropanol/acetone plant, adequate for some years. We have one oxo alcohol plant of small capacity in operation and one of 30,000 TPA coming up based on refinery propylene at an investment of well above Rs. 120 crores and one operating plant for isooctanol from imported heptene which is proceeding with expansion to 20,000 TPA on the same basis of imports. We have a SBR plant depending on butadiene imports and transporting across the country and one polybutadiene plant at IPCL. Existing programmes under various stages of implementation may take the country's investments in basic petrochemicals to over Rs 10,000 crores. The above data does not cover many of the pArojects which are not linked to petrofeedstocks (other than benzene/toluene) or many of the smaller ones. But we should mention some oddities. There are two projects for pro

pylene oxide and glycol and polyols from the propylene of Madras Refineries at the same site and at 10,000-12,000 tonnes a year at Rs. 60 to 70 crores investment -- an obvious error of judgement in approving two plants with expectation that one will be a non-starter. It would have been so, but for the fact that the original licencee, Kotharis who were a near sick unit, was taken over by SPIC. Then there is the revival of the old plants for polyethylene at Rishra in West Bengal and Bombay in Maharashtra by an ambitious entrepreneur who now faces problems on supply of alcohol to Rishra and restriction on expansion of the Bombay cracker.

Now for the new mega projects. There are half a dozen projects for olefins and downstream products -- a list which is topped by the Haldia Petrochemicals which has been in hibernation for a decade. NOCIL wants to 'expand' to five times the present capacity for olefins and downstream products at the present site instead of moving over to a newer distant location even though the investment is estimated at 25 times of the original investment at present site and the throbbing townships which have developed nearby. IPCL wants a 2nd cracker at its present site at double the old capacity, along with downstream plants. The UB Group is clamouring for a cracker complex at Vizakhapatnam and Goenkas with Linde want to have an export-oriented naphtha cracker in Madras with 350,000 tonnes ethylene -- no downstream products are mentioned. Government has already approved a gas cracker at Auriya in U.P. along with downstream products and this is to be assigned to IPCL. The proposal for a cracker complex in Assam and also one in Mangalore have been proposed. The Oswal Group want to step up capacity of the old Union Carbide cracker taken over by them to 100,000 tonnes ethylene. The latest is a claim for a naphtha cracker complex in Punjab -- though the refinery of the region is in Haryana. This crazy quilt of mega projects when completed may take India to a middle place in petrochemicals with 2 million tonnes ethylene and an equal tonnage of other olefins/aromatics. But the investments needed are probably in the region of Rs. 20,000 crores with equal amount in processing sectors -- certainly far beyond the efforts of mobilisation from the public even by a few Ambanis. Apart from the resources needed, the far more important questions relate to the demand build up. Certainly a seven fold rise in demand in a decade is far from realistic. Mega projects cannot languish for markets and be forced to work at 30 to 50% of capacity for period of 3 or more years. Mega projects need to be properly phased so that they get on stream at an appropriate time when markets can absorb the big jump in supplies. There are more problems when there are diverse products from a single petrochemical complex such as that of Reliance for example or of NOCIL if the five-fold expansion goes into production. A clear two year gap between the mega projects is required for Indian conditions over the next decade.

There had been talk of large exports and export oriented projects. The project proposed in Madras is one such but with only the olefins to export. A recent analysis on pricing for exports shows the basic weakness of a new project in India at higher costs and investments. The labour and supervision costs are no doubt lower in India but these constitute a very insignificant fraction of production costs. The cash incentive may have to be stepped up and several other measures introduced to sustain exports. There has also been talk of imports of ethylene to start with downstream products and build up demands, but the balance of payments situation does not give any hopes for this. The product imports are now near 1000 crores and we expect to turn the tables and export even more -- very ambitious indeed! Planning and permitting large projects on imports of basic intermediates is a very dangerous policy. We have present committments to import C7 or C8 olefins for oxoalcohols; butadiene for synthetic rubber in Bareilly; ethylene for vinyl chloride/PVC in the Ratnagiri coast; for products of the Haldia cracker and of Reliance Petrochemicals on an interim basis -- to cite a few cases. Some pending for such commitment are for an ambitious butyl rubber project in Vizakhapatnam for which MTBE is proposed to be imported to be split up to provide isobutylene for butyl rubber and methanol for methyl methacrylate to boot. We are courting disaster if we approve projects of this type requiring continued imports, more so with mega projects and when our debt repayment obligations are near the danger debt trap area of 25 to 30% of the export earnings.

Mega projects or mini mega projects do not go well with the ethyl alcohol chemicals where supplies at a central location from a few nearby producers are limited to perhaps 30 to 40 million litres. But we have reports of Rashtriya Chemicals & Fertilizers looking for projects for 2 ethyl hexanol and styrene monomer based on 60 million litres and now SM Dye Chem for 62,000 tonnes of ethylene oxide based on promise of another 60 million litres of alcohol which covers only 50% of the requirment -- both in Maharashtra where there is no such possible location even for one. There is a report of the India Glycols plant planning expansion from 20,000 to 60,000 TPA, also based on alcohol in UP on the plea of the prescribed minimum economic capacity which is certainly not valid for ethyl alcohol based chemicals. The MES prescripton is another aegis for mega build ups.

There is much for the newly constituted Petrochemical Planning and Development Authority to ponder over and avoid developments which are (i) likely to fritter away our limited financial resources, (ii)commit the country to medium/long term imports of feedstocks which often require half or more of the value of the products to be made, (iii) likely to create over ambitious capacities for specific products far in excess of demand build up, (iv) in pursuit of a mirage in exports other than properly tied up for at least five years and (v) not fully in line with our raw materials picture in the coming years.

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HEMICAL INDUSTRIES ASSOCIATION VOICES CONCERN

GNFC's formaldehyde project opposed

The Chemical Industries Association s viewed with great concern the issuce of a Letter of Intent by the Govnment of India to M/s. Gujarat armada Valley Fertilisers Company mited. for setting up a 30,000 tonnes r annum formaldehyde project. The ssociation is of the opinion that in comodating Gujarat Narmada Valley rtiliser Corporation's proposal, the overnment of India is exercising the ntinuance of its lopsided policy so far formaldehyde atleast is concerned.

A press release issued by the Assoation notes that the formaldehyde dustry in our country was overpopous even at its infancy round about 977-78 when Government of India dvised the units (vide their circulars ted 21st November 1977 and 4th Janary 1978) to explore the channels of versifications for better utilisation of eir capacity, which then was around 5 to 30 per cent. The installed capacy was to the tune of 1.4 lakh tonnes.

The press note adds: "Although any units followed the advice of the Union Government in establishing ownstream productions of hexamine, araformaldehyde etc, two things happened to maintain the gap in the utiliation of capacities although production nd to an extent consumption also had ncreased. One was the fact that most f the units so diversifying got their apacities also increased and the other as due to Government of India allowng captive additional capacities for ventures to the field of formaldehyde-based ownstream products like pentaerythriol. The result was that during 1986-87, he installed capacities were 1.70 lakh onnes which with permitted expanions, are threatening to rise up to 2.68 akh tonnes. The appearance of polyactal resins in the scene even as an mbryo has not changed the picture as t is also supported by fresh formaldeyde capacities.

"To the recent deliberations of the Apex Committee set up by the Department of Chemicals & Petrochemicals in which our Association served as a Member in the organic chemicals subgroup for fixing perspective plans for various chemicals for the period 1986-2000 A.D. the following figures of formaldehyde consumption were submitted revising the figures of earlier committees like that of Mr. Kapur.

Year	Consumption (Tonnes per annum)
1984-85	80,000
1985-86	97,700
1988-89	1,31,400*
1994-95	1,74,000*
1999-2000	2,12,000*

* Estimated

"The above figures will portray that even if the average production is taken as 80% of installed capacities, the existing capacities will take care of the total anticipated consumption since the consuming industries also will run only up to 80% of their capacity and formaldehyde offtake.

"In the meanwhile, sometime back Govt. of India had fixed Minimum Economic Scale (MES) for formaldehyde as 30,000 tonnes per annum. Although two or three of the existing 19 units adopted the increase of their capacities, the others could not or did not, owing to the unfortunate situation that prevails in the industry whose product remained, and continues to remain and tragically is expected to remain till 2000 A.D. in the buyers' market. If all the 19 units expand to 30,000 tonnes each which they can accomplish with minimum investment per unit product and with nil foreign exchange committment, the total productive capacities will be 5.7 lakh tonnes or atleast 80% of that in a consuming market that touches 2.2 lakh tonnes only in 2000 A.D. "We opine, therefore, that the contemplated entry of GNFC into this adverse picture and Government of India's okaying it, as reported, inspite of the fact that Union Government had rejected their approaches twice before, in 1986 and 1987, on the sound reasoning of overcapacity, would bring disastrous results to the existing investments in the country. Has the picture changed since such rejections before? No, it has not, as per the study of the Apex Committee which Government of India is expected to view with regard.

"That GNFC will be having surplus methanol when expanded to 1 lakh tonnes per annum and that its earlier attempt to divert this surplus into manufacture of acetic acid via methanol route had been scuttled by the momentum of loud noise generated by ethyl alcohol bodies like AABIDA and that most of the officers in GNFC have not concurred with the advisability of such a proposal from their management (we do not know whether it is only for acetic acid or for formaldehyde also) which was actually 'rejoindered' by Mr. M. Mukhopadhya, Chief Manager, Public Relations, GNFC, in the 'Financial Express' of 30th August 1989 — are all points unrelated to the main issue taken up for consideration in this statement. If acetic acid can be rejected on the plea of 'no need' for foreign exchange more so should be in the case of formaldehyde as Indian technology in this field has been firmly established and none of the present 19 units are expending a single paisa as Foreign Currency either for items of plant and machinery or accessories or stores as catalysts. On the other hand, acceptance of GNFC's proposal will be tantamount to a flagrant waste of valuable public resources whether in the form of Indian rupees or equivalent foreign currency.

"If GNFC do not have any justifiable outlet for surplus methanol, they should be advised to curtail methanol production or to expand into profitable and useful field, like diesel substitute which seems to be under the active consideration of Union Government in its Industry and Petroleum Ministries".

R. O.P. KHARBANDA

FRANKLY SPEAKING

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Winning At Project Management

This title (Robert D. Gilbreath, 329 p, 1986, John Wiley, Y) carries the explanatory subtitle: What works, what fails d why. A civil engineer, with a post graduate degree in gineering administration, author is an arbitrator with the merican Arbitration Association and already has a success- l book to his credit, 'Managing Construction Contracts' Viley, 198?). Full of common sense and wisdom, the book ows how to achieve success in your project all the way om conception to completion. Concerned more with fai- re avoidance rather than the conventional management pproach to achieving success, author concentrates on what OT to do in order to achieve success in projects.

The subject of winning in project management is covered 13 chapters entitled: 1 indications of failure; 21 inherent roject difficulties; 49 people; 67 organisations; 89 perspec- ves; 115 planning;; 143 information; 165 processes; 195 ontracting; 229 change; 253 standards; 279 outsiders; 297 ilure avoidance. At the end there is a unique and compre- ensive (12 p) failure success index, and also a short but ade- uate (4 p) subject index to help locate any specific item. he failure success index lists specific items with the cor- esponding page numbers under the subheadings: Failure ymptoms (12 nos.), failure tendencies (15), failure factors 15) and success factors (13). Failure factors include items uch as: carrots and sticks, project drives company, insisting n perfection, the myths of standard controls, paper tiger, pro- edural infatuation, poor contract documents, contracts never ormally terminated, and blaming outsiders for project suc- ess. The success factors inlcude: learning from mistakes and ailures, consider alternatives, accept some failure and keep ur bearings. According to one reviewer, the book contains tleast one good idea on every other page and that the fai- ure/success index alone is worth its purchase price.

Failure avoidance is seen as a powerful, proven weapon for achieving success in projects. Recognising one or more of the over 100 failure factors and 'extinguishing' them immediately or prescribing a remedy for them are among the most useful features of the book. The projects considered include: major capital construction to new market penetration, product development and even a merger. These and many other activities fit in with the broad definition of projects as being of temporary nature and goal oriented and taking place outside the scope of ongoing, mainline operations of a company. Projects are usually exciting and challenging, and they often require confrontation with the unknown, using the untested in order to achieve uncertain expectations. There is enormous risk and potential for failure, a phenomenon quite common in projects, but much neglected in terms of a proper study and analysis. An objective study of the causes and impacts of failure, and its application to projects can help ensure success. And it is much better and, of course a lot cheaper, to learn from failures of others. Most companies do not need and can ill afford to learn from their own mistakes.

Failure is seen as an expected and almost certain occurrence, that must be faced and tackled. Common symptoms to failure are described, failure tendencies explored and understood in order to be able to head off failure. Thus failure is averted by failure avoidance, the title of last chapter, with the subtitle: putting knowledge to work. The subheadings of this chapter convey a 'flavour' of the crux for project success: Learn failure, don't practice it; Know what a project is; Aim for areas, not points; Consider alternatives; Move the camera; Uncover the process; Leverage and multiply your success; Accept some failure; Build the adjustable analog; Bridge project gaps; Foster project intimacy; Keep your earnings; and learn from YOUR mistakes. On the whole, this is an excellent book on a vital subject, well illustrated by simple sketches, and the crucial points driven home through repetition.

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a isiting professor and an author of repute. His latest title: CAPITAL COST TIMATING FOR THE PROCESS INDUSTRIES with E A. Stallwor- hy (Butterworth end-1988)

IOCL proposes to make phenylglycine

Indian Organic Chemicals Limited (IOCL) is planning to make phenylglycine, a drug-intermediate used in life-saving drugs like ampicillin and amoxycillin. The company has already submitted a detailed proposal to the government for consideration.

The company has also made an application to the government for a letter of intent for increasing the production capacity of alcohol-based chemicals from 14,700 to 24,700 tonnes per annum as a result of growing internal demand and good potential for export. It has also approached the Maharashtra government for sanction of additional quota of alcohol for the expansion.

With surplus position for molasses and alcohol, we are hopeful that our case would be considered favourably by the state government and in turn by the Central Government, according to Mr. B.M. Ghia, Chairman of the company. The final implementation of the project would depend on the government policy with regard to manufacture of alcohol-based chemicals by alternate routes, he informed the shareholders at the annual meeting of the company at Bombay recently.

The company's chemicals division has been continuously showing good results. Its production capacity of benzylaldehyde is being increased in stages to 2,000 tonnes per annum. It hopes to reach a capacity of 1,000 tonnes during the current year as compared with 300 tonnes by the end of last year.

In the synthetics division, the performance has improved considerably due to increased sales of polyester filament yarn and rationalisation of the product-mix. The company expects to reach full production capacity in PFY during the current month and it hopes to raise it to 9,000-10,000 tonnes by the end of the year with a small investment of around Rs. 50 lakhs needed for minor modifications. It is also concentrating on high value added items such as specialised black fibre.

The company is also engaged in utilising higher production capacity of polyester fibre by making concerted efforts. It hopes to achieve 900-1,000 tonnes export per month soon.

The company's working during the current year so far has been good, with total sales in the first months (April-August 1989) reaching Rs. 93.50 crores as compared to Rs. 77.75 crores during the corresponding period of last year. Considering the good progress of the company, Mr. Ghia expressed the hope that he may be able to enhance the dividend handsomely by year end. The holding of shares by financial institutions total 32.3%, which include 16.3% by UTI, 6% by LIC and balance by bank and other insurance companies.

GLAXO INDIA TO COMMENCE CEPHALEXIN PRODUCTION SHORTLY

The commercial productiion of cephalexin at the Ankleshwar plant o Glaxo India Ltd. is expected to com mence shortly. The work on this faci ity is nearing completion. Work has als started at the Nasik factory for the estal lishment of manufacturing facilities fo formulations of asthma and cephalo porin injectibles. According t Mr. N.M. Wagle, Chairman, Glax India, plans are being drawn up t further expand the manufacturing faci ities at Aligarh. These plans ar expected to be implemented over th next two years.

Talking to shareholders of the com pany recently at the annual meeting i Bombay he said that the performanc of the company during the first fiv months of the current year was encou raging. Sales have registered a growt rate of 28 per cent over the sale achieved in the corresponding period o the previous year. It might not be pos sible to maintain this rate of growth i the remaining part of the current yea he said.

Lupin Lab to launch diagnostic kits

Lupin Laboratories Ltd. will soon launch research reagents and diagnostic kits for pregnancy and ovulation tests, blood in stool and the like, all products of the company's inhouse research and development work.

Such kits are now almost entirely imported. The Indian market for these products are estimated around Rs. 10 crores. Lupin's range will cover almost the entire market. These are the first fruits of Lupin's thrust in biotechnology, in which the company has invested Rs. 2.5 crores at Mandideep near Bhopal in Madhya Pradesh.

Lupin will also be the first to launch new generation cephalosporin injectibles (an advanced group of antibiotics) later this year. The company's Rs. 6 crores advanced cephalosporin project at Mandideep proposes to export more than 50 per cent of its injectible products. The earlier Rs. 4.2 crore oral cephalosporin plant in Mandideep too has been set up primarily for the export market, especially the US. The design and constructiion of the plant has been undertaken as per the regulations of the US Food and Drugs Administration.

The company's turnover is expected to cross the Rs. 200-crore mark this year, out of which about Rs. 30 crores will come from exports. Lupin has almost 70 per cent of the world market for ethambutol, a drug used in the treatment of leprosy. The company's joint venture in Thailand to produce bulk drugs, called Lupin Chemicals Thailand Ltd., is to go on stream this month.

MEHER PHARMA

Mr. Pravin V. Sheth, Chairman, Meher Pharma (India) Limited said in a press release that the company has done exceedingly well in the current financial year 1988-89. Its turnover, on annualised basis, shows a growth of [illegible] per cent at Rs. 10.67 crores. Improvement in sales turnover was due to the combined effect of intensive selling activities in the local market as also for carving a niche in exports during the year.

The company did take a deliberate decision to branch out in exports and this strategy has paid rich dividend, in that exports contributed almost Rs. 100 lakhs to the turnover in 1988-89. Profits after depreciation and interest likewise, improved to Rs. 53 lakhs in 1988-89. At this level, it witnessed an improvement of 200 per cent.

Commensurate with the improvement in the working results, the Directors have recommended a dividend of Rs. 2.10 per share (21%) compared to 7.5% on annualised basis in the previous period. The Chairman further indicated that the work on introduction of few life-saving products continues and these products will be launched as soon as the clinical trials are over.

RANBAXY'S RECORD SALES

Ranbaxy Laboratories has reported excellent working results for the 15 months ended March 31, 1989 with an increase in the turnover by 28.6% to Rs. 179.68 crores from Rs. 111.76 crores. The net profit, before depreciation and taxation, has risen impressively by 52.4% and crossed the Rs. 10 crore mark to Rs. 10.19 crores from Rs. 5.35 crores in the previous 12 months.

A final dividend of 12.5%, taxable, is to be paid making, with the interim, a total of 27.5%, taxable, for 15 months on equity capital enlarged by the issue of bonus shares in the ratio of two shares for every five equity shares held. The distribution therefore works out to 22%, taxable, per annum against 20%, taxable, previously. The rate is higher at 30.8%, taxable, on the old capital. The equity shares allotted to the holders of convertible bonds on March 31, 1989 are ranking for dividend only out of the profits for 1989-90.

The sum set aside for depreciation is Rs. 4.06 crores (Rs. 2.10 crores) and taxation Rs. 56 lakhs (Rs. 52 lakhs). The net profit, after tax, has nearly doubled to Rs. 5.57 crores from Rs. 2.73 crores. The equity dividend will absorb Rs. 1.46 crores (Rs. 77 lakhs). The research and development department has been successful in producing many bulk drugs and formulations and these have been exported in large quantities to developed and developing countries. The profits for 1989-90 may constitute fresh records as sales in the first 5 months (Apr.-Aug.) were as much as Rs. 77.20 crores against Rs. 62.18 crores in the corresponding period in 1988-89.

NEW CAMBRIDGE UNIVERSITY PROFESSORSHIP TO PROBE THIRD WORLD DISEASES

New and more effective means of control and treatment of Third World parasitic diseases, the cause of widespread suffering and death, is the ultimate aim of a new professorship at Cambridge University announced in London on September 4, 1989. The new professorship has been endowed by Glaxo Holdings U.K., with a capital sum and grants totalling £1.1 million.

The University of Cambridge is carrying out a world-wide search for an outstanding candidate to become the first Glaxo Professor of Molecular Parasitology. The endowment is designed to improve understanding of some of the major health problems facing the Third World. It is hoped that greater knowledge of the molecular basis of human parasitic diseases will lead to the development of better control and treatment. The professorial unit will consist of the professor, a non-clinical lecturer, a technical officer and a secretary. Grants provided by Glaxo Group Research for the support staff for five years should help to attract the best possible candidate to the professorship.

JK Synthetics promotes new company to make PTA

JK Synthetics is promoting a new company called JK Petrochemicals Ltd. to implement the letter of intent to manufacture two lakh tonnes of purified terephthalic acid (PTA) at Saleempur in Uttar Pradesh.

The company is negotiating with several international financial institutions and banks for long-term foreign exchange loan and equity participation in the project. Following the grant of a letter of intent three months ago, substantial progress has been made with regard to implementation of the aromatics and PTA project, a company spokesman said.

The UP Government has allotted 900 acres of land at Saleempur and has promised supply of power and water requirements of the project from nearby sources. The clearance from the Pollution Control Board is under way and construction of a railway siding at the plant site, some eight miles from Hathras junction, is being expedited. The company has tied up its feedstock requirement with Mathura Refineries Ltd. Similarly, negotiations with several reputed engineering contractors are under progress. However, the bulk of the engineering contracts are to be implemented by Jaykay Tech. Ltd., who haave the collaboration of SNC/FW of Canada.

As for technology, both Amoco of the US and ICI of the UK are keen to offer knowhow for PTA and negotiations are in advanced stages with both parties, the company spokesman said. Amoco is the largest producer of PTA and have licensed more than 30 plants all over the world and are the original licensors to both ICI as well as Mitsui Petrochemicals of Japan. It was only recently that both ICI and Mitsui were free to licence PTA technology to third parties and the first plant licensed by ICI happens to be Reliance Industries Ltd.

Mitsui Petrochemicals has also submitted their proposal for PTA knowhow to JK Synthetics, but since they have tied up with National Aromatic Petrochemicals Company Ltd. (NAPCO), a joint venture being promoted by Madras Refineries Ltd. and SPIC, they are out of the race with JK Synthetics.

The JK group itself will be consuming nearly one lakh tonnes of PTA and there is a ready market for over two lakh tonnes within a short radius of Saleempur, according to the company. The Government has cleared a proposal for increasing the PTA capacity from 1.50 lakh to two lakh tonnes a year following the recent enhancement in the minimum economic size.

BRPL SETS NEW RECORD

The public sector Bongaigaon Refinery and Petrochemicals Ltd. (BRPL) has set a new record in both crude output and petrochemicals production during the financial year 1988-89. An official report at Guwahati said the refinery section processed 1.16 million tonnes of crude, the highest ever by the company. It was 5.1 per cent higher than the previous year's output of 1.10 million tonnes.

Production of petrochemicals registered a 22.1 per cent increase compared to the previous year. The sales turnover of about Rs. 339 crores this year gave the company a profit of about Rs. 21.92 crores, the report said. The report said the polyester staple fibre plant was also commissioned this financial year. The plant was on trial production since April, 1988. With the commissioning of the plant, the entire BRPL complex has become fully operational.

The BRPL proposes to set up a modern training centre to develop human resources to meet the technological and managerial needs, the report added.

PROF. M.M. SHARMA APPOINTED DIRECTOR, B.U.D.C.T.

With effect from 1st September 1989, Prof. M.M. Sharma has been appointed as the Director of the prestigious Bombay University Department of Chemical Technology. Born on May 1st 1937 he has several degrees to his credit: B. Chem. Eng. (Bombay University), M.Sc. (Tech.) (Bombay University), Ph.D. (Cantab). Since September 1964, he has been professor of Chemical Engineering, University of Bombay.

The Government of India had bestowed on him, the PADMA BHUSHAN award in 1987, in recognition of his valuable contributions to the chemical industry. A professor of international repute he has various awards/honours to his credit. To name a few: Moulton Medal of Institution of Chemical Engineers, UK (1971, 1977), and the S.S. Bhatnagar Prize in Engineering Sciences (1973). He is also a Fellow of the Indian Academy of Sciences (1974), and of the Indian National Science Academy (INSA) (1976).

Prof. Sharma has also been editor of *Chemical Engineering Science* UK (1975-1986) and associate editor of *Chem. Eng. Res. Des.* U.K. (1974-1986). He has published extensively and his book titled "Heterogeneous Reactions: Analysis, Examples and Reactor Design" Vols. I & II in association with Dr. L.K. Doraiswamy has been internationally acclaimed.

MEGA-PETROCHEM PROJECTS

Bennet Coleman proposal off

Bennett Coleman and Company Ltd. the publishing house which surprised everyone by bidding for mega-petrochemical projects costing about Rs. 410 crores, has virtually abandoned the same. Sources in Bennett Coleman confirmed that "we are not pursuing the projects". The company is now concentrating on diversifying further in the publishing line.

Earlier this year, the company sought letters of intent for setting up projects to manufacture polyethylene and acrylonitrile in Auriya in Uttar Pradesh. Later, the company sought permission to set up SBR (synthetic rubber) MTBE (motor fuel additive) and other chemicals in Raigad district of Maharashtra.

The Jains also managed to get the Maharashtra Chief Minister, Mr. Sharad Pawar, to write to the Industry Minister, Mr. Vengal Rao, recommending that Bennett Coleman be favoured with a letter of intent for the SBR project so that Maharashtra Petrochemicals Ltd. could withdraw from the same. Besides the group also planned to set up a unit to make monosodium glutamate, the Chinese seasoning popularly called Ajinomoto.

Even if the group went ahead with the project, it would have found it very difficult to raise money from the capital market. The group has no experience in the line. The financial institutions now want a clause in all new letters of intent saying that the promoters will not resort to institutional funds. The Planning Commission is also reportedly in favour of such a move.

COCHIN REFINERIES PAYS 18%

Cochin Refineries which reported a gross profit of Rs. 74.10 crores in 1988-89 has declared a dividend of 18 per cent for the year against 12 per ce in the last two years.

Addressing the annual general mee ing the Chairman and Managing Dire tor of the refinery, Mr. J. Jayarama announced that capacity is proposed be raised to 65 lakh tonnes from 45 lak tonnes. A long-term expansion pr gramme has also been chalked out, h said.

Production of certain other petro chemicals like paraffins, is on the card Benzene output will be stepped up. Th chairman pointed out that the Rs. 7 crore benzene plant has been commi sioned. The refinery claimed to have s a record by processing 47.6 lakh tonne of crude during the previous yea achieving 105.8 per cent capacity uti isation. This was against the targete 47.5 lakh tonnes.

Records were also set in regard to th production of petrol as well as liquefie petroleum gas. Production of petroleu last year was 3,60,186 tonnes and tha of LPG 1,38,386 tonnes.

Green signal for two petrochemical projects

Two petrochemical projects in the public sector have been cleared by the Cabinet Committee on Economic Affairs on September 12. The tie between the two public sector units — the Gas Authority of India and the Indian Petrochemicals Corporation Ltd. for the Auriya unit in Uttar Pradesh has been resolved with the former getting the Auriya unit and the latter getting the Gandhar unit in Gujarat.

Two units in the private sector also came up for consideration but a decision is understood to have been deferred. These are the gas based Vizag unit of the United Breweries of Mr. Vijay Mallya and the expansion of the Thana Petrochemical unit of the NOCIL. Mr. Vijay Mallya has been canvassing for the Vizag unit. The United Breweries is diversifying in a big way. The Vizag petrochemical unit is of 3 to 4 lakh tonnes capacity. The collaboration is with Mitsui of Japan.

The Auriya unit which is also gas based is of similar capacity. The economic size for a gas based petrochemical unit is considered to be between 3 to 4 lakh tonnes whereas for naphtha based unit the minimum economic size is considered to be about 250 thousand tonnes.

Both the Gas Authority of India and the IPCL have been claiming the Auriya unit. The department of Petroleum has been pressing for the Auriya unit to be given to the GAIL as the latter would not have much work on hand with the laying of gas pipeline nearing completion. On the other hand the Department of Chemicals and Petrochemicals would like the IPCL which had the experience in the line to legitimately get it. The matter had been considered by the secretaries earlier. As a compromise it has been decided to award the Gandhar unit to the IPCL and the Auriya project to the GAIL

These four units will increase the total capacity for ethylene production to 2 million tonnes. There are more projects in the pipeline. The Haldia petrochemical unit in West Bengal is still hanging fire. The Mangalore joint sector unit is expected to be cleared soon.

The Assam Government also has indicated to the Centre of their intention to set up a petrochemical unit in the joint sector adjacent to the new refinery planned in the state.

All these are expected to get clearance in due course. With additional gas finds, the Government, proposes to license additional units. Every State is said to be demanding a petrochemical unit. The Government of Punjab has also written to the Centre demanding a petrochemical complex. There is a fear that if all these units come up there might be excess capacity for petrochemicals.

Decision irks West Bengal

Centre's reported clearance of two petrochemicals projects, one at Uttar Pradesh and the other at Gujarat, within 48 hours when the state's Haldia Petrochemicals was pending since 1977, has taken the members of the ruling party in West Bengal assembly by surprise.

The House saw members condemning the Centre's "blatant move" before the elections. Mr. Robin Mandal, CPI(M), wondered how could the finance ministry's sub-committee take such a quick decision and then issue the letters of intent of two projects worth Rs. 4,000 crores within so short a time.

He demanded a statement on this from the state government and asked whether it should not protest to the Centre on the matter. The "discrimination against West Bengal was too glaring", he added.

Dr. Asim Dasgupta, state's finance minister, too said that the state was "amazed" by the alacrity by which the two petrochemical projects were cleared while West Bengal's Haldia project was held back. He said that the people of West Bengal should protest unanimously against this discrimination.

In a statement, he said the letter of intent of Haldia Petrochemicals project was received in November 1977. It was followed by a detailed project report by the state government in May 1980 and the applications for various licences and clearances in August 1981.

The Centre, he said, decided in July 1984 not to participate in the project and the state was compelled to take the project up on its own. In May 1985, the state decided on joint sector project participation with private collaborator R.P. Goenka group, and furnished the techno economic feasibility report with a new product mix to the Centre in September 1985.

In September 1986, an application was made to the IDBI-led consortium for funding of Rs. 1,350 crores as the project cost. The Industrial Development Bank of India appraised the proposal and worked out the cost at Rs. 1,472 crores and approached the committee headed by the Union Finance Secretary for clearance.

The state approached the Centre for immediate clearance of financial package so that the state government could start the work at Haldia where the state had already spent Rs. 7.15 crores for land acquisition.

Dr. Dasgupta informed the House that the chief minister met the Union Finance Minister on June 22, 1989. But further developments were still awaited. He said that it was state's apprehension that further delay in clearance of the project would escalate the estimated cost of the project and stand in the way of the industrial growth of the state.

Mangalore refinery project to cost more

Depreciation in the value of the rupee has pushed up considerably the cost of the Mangalore Refinery and Petrochemicals project proposed to be set up jointly by the Hindustan Petroleum Corporation Limited (HPCL) and the Indian Rayon Industries Limited (IRIL).

The project, which according to preliminary estimates made in July 1988, was to cost Rs. 1,050 crores, will as per latest estimates, cost Rs. 1,540 crore. Bulk of the increase is attributed to the depreciation in the value of the rupee during 1986 and 1988.

Certain doubts have also been raised about the validity of the three million tonnes capacity refinery proposed to be set up as part of the project, as well as about the market for the products to be produced by the naphtha based petrochemicals complex.

It may be mentioned that a memorandum of understanding was signed between the public sector HPCL, IRIL of the Aditya Birla Group and the government of India in June 1987 for forming a new joint venture company for the project. The new company Mangalore Refinery and Petrochemicals Limited (MRPL) was incorporated in March 1988.

The detailed project report (DPR) submitted by MRPL to the government envisages a three million tonnes per annum refinery integrated with a naphtha cracker of 2.50 lakh tonnes per annum of ethylene capacity.

Based on December 1988 prices, the capital cost of the refinery is estimated at Rs. 862 crores and the petrochemical complex at Rs. 687 crores, making a total of Rs. 1,540 crores.

The total capital cost includes a foreign exchange component of Rs. 425 crores, financing cost of Rs. 237 crores, project customs duty of Rs. 251 crores and contingency provision of Rs. 69 crores.

According to the DPR, the project is to be financed with an equity of Rs. 308 crores, including Rs. 160 crores from promoters and Rs. 148 crores from Indian public and non-resident Indians. Rupee debt has been taken as Rs. 807 crores, including non-convertible debentures (Rs. 363 crores) and non-convertible debentures with warrants (Rs. 444 crores).

Technology selection has also been made by MRPL on the basis of the bids invited by it. For the refinery, MRPL has selected UOP of United States for hydrocracking, LPG and kerosene, KTI of United States for hydrogen manufacturing, Shell of Netherlands for Soaker visbreaking and Engineers India Limited for sulphur recovery.

In case of the petrochemical units, Engineers India Limited has been selected for aromatic extraction Lummus Crest of United States fo naphtha cracking and pyrolysis gasolin hydrotreating, the BASF of West Ger many for butadiene extraction.

According to the DPR, the total com plex could be commissioned by Jul 1993 if the government approval wa granted by July 1989 and lump sur turnkey contract awards made in Jul 1990.

However, the project is expected t go to the Public Investment Board fo approval only some time next mont and this schedule cannot be adhered to

SHILPA TRADING SHIFTS

M/s. Shilpa Trading Pvt. Ltd., a lead ing firm of pharma raw materials ha recently shifted to a new and spaciou premises at Rahimtoola House, 7 Homji Street, Bombay 400 001. (Phone 286 41 32).

UB'S PETROCHEM PROJECTS

Berger Paints to be co-promoter

Berger Paints India Limited will be the co-promoter of two major projects to be launched by the UB group, namely, UB Elastomers and UB Petrochemicals. With the launching of the projects, according to Mr. Vijay Mallya, chairman, Berger Paints, the shareholders of Berger Paints could hope to be partners in the steady progress of the group.

The other companies in the group, Mr. Mallya told newsmen at the end of the annual general meeting of Berger Paints at Calcutta on September 15, had already acted as co-promoters of some of the new projects being launched by the group, thereby benefiting their own shareholders. However, no such opportunities were so far there for Berger Paints.

The Rs. 1,800 crore petrochemicals project would have an equity size of about Rs. 700 crores, Mr. Mallya said indicating that foreign collaborators might pick up anything between 25 and 40 per cent of the equity. He did not think that the government regulations would stand in the way of the participation of foreign companies in the equity of the company.

The petrochemical project will be a naphtha cracker project with a capacity of 320,000 tonnes. The clearance of the Project Approval Board of the government has been obtained. Only the approval of the Cabinet is awaited.

The Rs. 360-crore UB Elastomers will have a capacity of 30,000 tonnes of butyl rubber annually. This project, as Mr. Mallya pointed out, would be the only of its kind in the country. The size of equity had not yet been finalised, he said ruling out the possibility of foreign equity participation in the project.

Earlier, while addressing shareholders of Berger Paints, the chairman said a target of Rs. 100 crores of turnover and profit before tax of Rs. 2 crores had been set for the current financial year. He had no doubts that the company would be able to achieve the target, no matter how difficult the condition might be for the paint industry. "We in the UB group believe in achieving excellence by following our unique style", he observed.

The production of powder paints, to begin shortly, and of the new generation automotive coatings, among other things, according to Mr. Mallya, were sure "to carve out for themselves special niches" in the market, thereby helping to boost the company's performance. "From now on, the emphasis will be more on the production of high-valued items not prone to general market upheavals", he said.

The paint market in India, he said, had been very bad, very poor and extremely difficult. The performance of most of the leading paint companies suffered a setback, some even trying to put up a brave front by changing the financial year and following other methods. "We do not believe in manipulations", he said. "If the situation is bad, we will call it bad and try to do everything possible to meet the situation".

He, however, felt that the company did not perform too badly in the nine-month period ended March 31, 1989, when it earned a pre-tax profit of Rs. 1.08 crores on a turnover of Rs. 66 crores. The company declared 20 per cent dividend for the period.

BLUE BLENDS PETROCHEM SETS NEW TREND

Blue Blends Petrochemicals Ltd., a company promoted by the Arya group, has revealed sales and profit projections for the next four years in the prospectus inviting public participation. This is perhaps for the first time that a company is mentioning projections in the prospectus. Mostly, promoters give a broad picture of the likely business prospects in the prospectuses while raising funds from the capital market.

Mr. Anand Arya, chairman of the company, says that the projection figures have been furnished with a view to giving precise idea about the future earnings of the company. He further adds that the registrar of Companies has approved of the prospectus, including the projection figures.

According to Mr. Arya, the company would be able to earn sufficient profit to declare a reasonable dividend in the very first full year of its commercial production.

The company is raising Rs. 13.20 crores through issue of 11 lakh (14%) fully convertible debentures of Rs. 120 each to finance its Rs. 18.30-crore project. It is setting up a project at Vapi for the manufacture of various chemicals such as beta naphthol, bon acid, peri acid, chicago acid, metanilic acid, naphthols and reactive dyes. The company's dyes intermediate plant commenced production in July last. This plant would provide intermediates for the manufacture of a wide range of chemicals. The Vapi plant is scheduled to commence production by March 1990.

According to the prospectus, the company would achieve a turnover of Rs. 2.24 crores and earn a gross profit of Rs. 60 lakhs for the year ending March 31, 1990. The company's sales are expected to increase to Rs. 24.38 crores and the gross profit to Rs. 5.12 crores for 1990-91, the first full year of production. Sales are projected to go up to Rs. 29.81 crores for 1991-92 and to Rs. 35.23 crores for 1992-93. The gross profit is estimated at Rs. 7.45 crores for 1991-92 and Rs. 9.16 crores for 1992-93. Mr. Arya says that the company would be able to achieve better results than projected in the prospectus.

Scope to raise plastics use

With several new petrochemical projects on the anvil, will India be producing more plastic raw materials than the country requires? Many think so, glossing over the fact that the per capita consumption of plastics in India is amongst the lowest in the world, even below that of Africa. Numerous potential areas where plastics could replace scarce resources like wood and metal remain untapped because of high price of polymers and vested interests.

Indian Petrochemicals Corporation Ltd. has launched projects to substitute tin cans with plastic containers in two sectors — packaging of lube oils and edible oils. These two sectors alone will require about two lakh tonnes of polymers. IPCL and Indian Oil Corporation (IOC) have set up a joint task force to go into packaging of all lube oil packs up to five kg. in plastic. This will require about one lakh tonnes of polymers a year.

The National Dairy Development Board Chairman, Dr. Verghese Kurien, is personally associated with the project for packaging edible oils in plastic containers. It is estimated that plastic packaging of all one kg. tin cans will consume 70,000 tonnes of polymers. About 40 lakh tonnes of edible oil is distributed through the public distribution system. The above two projects should, in the coming years, save foreign exchange worth crores of rupees spent on tin imports and lead to a quantum jump in polymers consumption. Similar projects are under way for replacing wooden furniture with plastic, substituting paint cans with plastic cans etc.

The report of the working group on introduction of plastic furniture in the country has been submitted to the Government.

The Government wants to promote wood substitutes in view of the widespread deforestation and its ecological impact on the country. "Wooden furniture is one of the major users of prime quality wood and provides an important commercial motive for the felling of trees", the report observes.

It has identified three basic constraints in the promotion of plastic furniture: The high cost of plastic furniture due to high cost of raw materials and fiscal levies (plastic furniture is costlier than their wooden counterparts by 20%), buyers' preference and resistance to change and thirdly, technological hassles in design, stability, performance and the like.

The report has recommended the following fiscal measures to promote the industry: Creation of a separate excise classification of plastic furniture (to qualify for the classification, at least 60% of the raw material cost of the item should be plastic in origin); a dialogue with State Governments to classify plastic furniture in a separate sales tax category with a lower level of taxation and exemption of customs duty on imports of moulds, old as well as new, for plastic furniture.

BPCL TO SET UP GRASSROOT REFINERY

The Minister of State for Petroleum and Natural Gas, Mr. Brahm Dutt, said that the Government had received a proposal from Bharat Petroleum Corporation Ltd. (BPCL) to set up a six-million tonne per annum grassroot refinery in Central India and a committee has also been constituted to identify a suitable site for the refinery.

The Minister, who was addressing the members of the Consultative Committee attached to his Ministry also disclosed that Indian Oil Corporation (IOC) has submitted the feasibility report to the Government for the proposed refinery to be set up at Daitari, 100 km. from Paradip Port, in Orissa.

Also, a feasibility report had been submitted by IOC for setting up a pipeline from Daitari to Allahabad with tap off points at Rourkela and Ranchi.

Need for proper execution of chemical projects

The Chairman and Managing Director of Indian Bank, Mr. M. Gopalakrishnan, urged the chemical industry to produce chemicals suitable for the country's labour-intensive economy, besides having good export potential.

Inaugurating the southern regional conference of the Chemicals and Allied Products Export Promotion Council (CAPEXIL) at Madras, he said the chemical industry has acquired international standards in nitrogenous fertilisers, paints and dyestuffs. But the gestation period for chemical projects was three to five times more than in the OECD (Organisation for Economic Cooperation and Development) countries. This meant cost overrun. Hence the need for proper planning and execution of chemical projects.

Mr. K.K. Bhatia, chairman, CAPEXIL, who welcomed the gathering, wanted a definite policy decision on permitting individual units to import machinery for modernisation at concessional tariff against suitable export obligation. Units exporting more than 25 per cent of their production should be granted the benefit of pro rata reduction of customs tariff in respect of imported plants and equipment for modernisation. The FERA should be modified to permit foreign equity participation beyond 50 per cent, he said.

National policy on mining urged

The need for a national policy on mining/quarrying that will ensure granting of leases for a minimum period of 20 years was stressed by Mr. Bhatia. Such a policy will include private mine owners to go in for modernisation and scientific exploitation of mines, resulting in massive growth in the export of granite and minerals within a short period, according to Mr. K.K. Bhatia.

He said the restrictive policies of the various State Governments in the matter of sanctioning or renewal of mining/-quarrying leases have proved to be major "stumbling blocks" in the development and modernisation of mines and processing of minerals.

He pointed out that because of this, the council has fixed a low export target of Rs. 2,050 crores for the current year, which covers minerals and ores, cement and granite that have been newly brought within the fold of the council. These items are, otherwise, of great export potential, he said.

In this context, Mr. Bhatia said he was happy that the Tamil Nadu Government had recently relaxed its mining leasing policy for granite. This will give a big boost to the production and export of granite items from the State.

Mr. S. Vedam, Chairman, CAPEXIL, southern region, said in his keynote address that export from the region registered an increase of more than 35 per cent, from Rs. 155 crores to Rs. 210 crores, last year. This was nearly 28 per cent of the total export of Rs. 744 crores from the country.

The targets for the region in the current year have been fixed at Rs. 249 crores (excluding new minerals) and Rs. 419 crores (total), he said.

Mr. Vedam, however, felt that certain restrictions came in the way of efforts to promote exports from the south. To begin with, he said export of plywood and wood products can be substantially raised if the present policy is modified to permit free export of sawn timber exclusively out of imported wood with a minimum value addition of 25 per cent.

He also noted that there has been a drastic reduction in CCS benefits on items such as sanitaryware, insulators, abrasive lapping powder, etc. The regional vice-chairman, Mr. T. Eapen Koshy, proposed a vote of thanks.

A rapid wrap-up of what's new in Operations, Processes and Products

Asymmetric synthesis (AS)

There is increasing interest in drugs and agrochemicals industries to make a specified optically active chemical and one forecast indicates that by 2000 A.D. the present level of production which constitutes around 22% will move on to over 50%. As is well known one optically active substance can be drug and the other one even a poison. Even in the simple case of limonene one enantiomer smells of lemons and the other of oranges; one of carvone smells of caraway, the other of spearmint. Both enantiomers of sucrose are sweet but only naturally occurring D-enantiomer is metabolised, making the synthetic L-enantiomer a potential dietary sweetner. Even more striking is the case of agro-chemicals where one enantiomer may be a repellent and other an attractant and the mixture ineffective. Optically active compounds are finding uses in areas of molecular electronics and optical data storage; liquid crystals may well make use of optically active monomer. A recent issue of *Chemistry in Britain* (1989, **25**, (March) 259-292) covers this subject in a fascinating way.

S.G. Davies has discussed chiral auxiliaries (p. 268-272). Chromium tricarbonyl can be attached to o-anisaldehyde to introduce chirality to the molecule. Thus the Grignard reaction of benzaldehyde with methyl magnesium iodide can be manipulated to give optically active phenolic ethanol. The potential of iron chiral enolate for AS is illustrated with the example of the antihypertensive drug (-)-captopril and the potent collagenase inhibitor (-)-actinonin. ß-Lactum syntheses are also covered. The ability of chiral auxiliary based reagents to discriminate between the two enantiomers of a racemic substance allows the selective transformation of only one enantiomer of the substrate to product, leaving the other unaffected.

J.M. Brown (p. 276-280) has covered asymmetric homogeneous catalysis. The present generation of homogeneous catalysts can rival enzyme in their selectivity, reactivity and gentleness of reaction conditions. Sharpless' asymmetric epoxidation of allylic alcohols, including the recent use of zeolites, dihydroxylation with OsO_4 based catalysts, etc. are covered. C-C Bond formation is covered. The Diels-Alder reaction holds great promise in AS because upto four new stereocentres are formed as a result of the cycloaddition reaction. Catalytic kinetic resolution is gaining importance. At ambient temperature, a free energy difference of 12 KJ per mole between the two paths is conducive to give 99% ee.

A.J. Pratt (p. 282-286) has covered the use of enzymes in AS. Enzyme systems provide the opportunity for doing several reactions sequentially with no intermediate purification step. An interesting example is that of *Pseudomonas putida* allowing conversion of benzene *cis* diol. In Vitamin C production new breakthroughs are expected and the recent Japanese work on microbial route to 2-ketogluconic acid deserves mention. The area of antibiotics holds high promise.

G.W.J. Fleet (p. 287-292) has covered homochiral compounds from sugars. Carbohydrates provide the greatest range of homochiral precursors. There are many readily available cheap sugar lactones whose chemistry is rich and varied.

A recent note on new organomolybdenum reagents for synthesis, conducted by Prof. J.W. Faller in U.S.A., has appeared (*Chem. Eng. News*, 1989, May 8, p. 30) (*Tetrahedron Lett.*, 1989, **30**, 1769). These reagents react with aldehydes to produce optically active homoallylic alcohols in 98% ee. Further these reagents are insensitive to air, moisture and protic solvents.

Noyori (from Japan), who has made very valuable contributions in this field, in his Centenary Lecture to the Royal Society of Chemistry, has given a fascinating account of this subject. Asymmetric catalysis is a four-dimensional chemistry which consists of two fundamental elements in Nature; Chirality and Circularity. High efficiency is obtainable by creation of ideal three-dimensional structure (x,y,z) coupled with appropriate kinetics. Chirality does play a central role in science and technology. The use of Chiral Schiff base has resulted in a dramatic improvement of the optical yield of the cyclopropanation, allowing AS of Chrysanthemic acid derivative in upto 94% ee. The industrial synthesis of (_-2,2 dimethyl cyclopropane carboxylic acid, a component of Cilastatin, is another example. Yet another example of a large scale operation is that of Takasaga Int. Co. of Japan for the production of (-) menthol. (*Chem. Soc. Rev.* 1989, **18**, 187-208).

Formation of submillimeter liquid-encapsulated gas bubbles in an immiscible liquid

Mori et al., have described a simple device which enables a steady formation of small 'two-phase bubbles' each consisting of a core of a gas and a shell of a liquid which is immiscible with the surrounding liquid. Bubble diameters less than 1 mm have been successfully formed. Surfactants should not be present. (*J. Chem. Tech. Biotechnol.*, 1989, **45,** 311).

Liquid phase mixing in a flotation column

Flotation columns are extensively used but the mixing behaviour has not been systematically studied. Mauros et al., have made measurements in an 8 cm i.d. 1.0 m high column operated counter-currently; conductivity measurement was made for liquid phase RTD. An increase in gas rate enhances mixing and an increase in the liquid flow rate leads to plug flow. (*Int. J. Mineral Processing*, 1989, **26,** No. 1/2, p. 17-27).

High Purity Fructure (HPF) from syrups

Barker and Ganetsos have made innovations in column chromatography to obtain HPF. As is known, fructose-saccharin mixtures have greater sweetness but less calories than sucrose. In the proposed separation, glucose is simultaneously converted to low mol. wt. dextran. These authors have developed continuous columns and a lot of modelling was done. Fructose forms a loose complex with the Ca^{2+} in the resin. (*Chem. Brit.*, 1989, **25,** Feb., p. 118).

World petrochemicals in the coming decade

W. Vergara (of World Bank) has given perspectives of this very important sector of the chemical industry. The feedstock position has changed greatly from naphtha to LPG to ethane/propane. USA and W. Europe account for over 65% of the world demand. In 1987 the world demand of L/LLDPE + HDPE was 23 mtpa; PP = 8.7 mtpa; PS = 6.0 mtpa; PVC = 13.7 mtpa. Synthetic rubber was 10.8 mtpa. The projected 1995 demand is as follows: Ethylene ~ 57 mtpa; Propylene = 32 mtpa. Developing countries are going to exhibit some interesting features. (*Chem. Eng. Prog.*, 1989, **85,** May, p. 24).

Solubilization of lipid-soluble vitamins in water with poly (N-vinylpyrrolidone) (PVP)

Inamura et al. have shown that aqueous solutions containing PVP (mol. wt. 40,000) can solubilize Vitamin A, E, D_2 and D_1. It is interesting to note that PVP also stabilized Vitamin E against uv iradiation. The structure of solubilized species has been studied. (*Chem. Lett.*, 1989, p. 105).

Absorption of NO in low volatile organic liquids containing cupric halides

The removal of NO_x from flue and off-gases continues to be an important topic. The use of ferrous --EDTA/NTA complexes suffers from the loss of ferric -- due to O_2 in the gases to be treated and reduction of ferric to ferrous by different reducing agents has not proved to be successful. W. Gestrich has brought out the utility of tributyl phosphate/tetra/triethylene glycol dimethyl ether as a solvent containing cupric chloride/bromide under anhydrous conditions. Reversible complexes are formed and loading of NO could approach mole/mole of cupric halide. (Cu X_2 can be loaded to the extent of 1.3M) This process merits consideration. (**Chem. Eng. Technol.,** 1989, **12,** 33-37).

Organic chemicals via electrochemical process (ECP)

Physical properties of electrons are extraordinary and very different from other chemical reagents. They are available "on demand" and can be manipulated to carry out oxidation or reduction. Toomey and Yu (of Reilly Ind. -- this company practices ECP) have brought out advantages and limitations of ECP. ECP leads to highly selective reactions under mild conditions and many times without any effluent. High performance plastics have enabled easy construction of cells and the plate-and frame design has become popular. Scale-up is possible and once a cell design has been standardised, production on a large scale is a simple matter as more cells have to be put-up. The flow of electrons can be either series (bipolar) or parallel (monopolar). Large scale production adopts monopolar operations. Multi-phase systems can be handled and transfer of ions can be coaxed with phase transfer catalysts, surfactants, etc. Solubilization can be done with hydrotopes like toluene/xylene sulphonic acid. Polar solvents like acetonitrile, DMSO, etc. have been considered. (*Chem. Engg.*, 1989, June, 140-147).

Recovery of high value soluble catalyst from purge stream

Union Carbide have patented a process for the recovery under reference in connection with a new process for making ethylene glycol via. reaction between ethylene oxide and CO_2, in the presence of KI, to give ethylene carbonate and subsequent hydrolysis. A purge stream of

polyglycol containing KI is encountered and in a 140,000 tpa plant losses of KI could be as high as 15.5 Kg/hr, without recovery equivalent to 2 m $ p.a. Catalyst recovery is done via a cyclation with acetic acid and removal of water azeotropically with toluene; solubility in acetate is very low. The precipitated catalyst is filtered and recycled. The ester is hydrolysed and acetic acid is recovered and recycled. (*Process Engg.*, 1989, May, p. 21).

Oxidation of methacrylic acid esters (MAE) with H_2O_2 to pyruvic acid (PA)

Inoue **et al.** have shown that oxidation of MAE with H_2O_2 in the presence of catalytic amount of chromium compounds as a catalyst gives PA along with the formation of HCOOH and CO_2. Cr(III) acetyl acetonates gave methyl pyruvate (MP) in 70% yield at 50°C. With chromic acid and triethyl amine (1:1) 82% conversion with 72% selectivity could be realised to MP at 40°C. (Chem. Lett. 1989, p. 99).

Deactivation of catalyst gauzes in oxidation of ammonia

Lee and Farranto (of Engelhard, USA) have brought out some very useful features during start-up of a nitric acid reactor when unsually high surface temperatures can be generated due to ignition of transient species. (Start-up is done with a hydrogen torch). It is to be noted that the catalyst surface temperature can exceed the maximum adiabatic temperature, depending on the propagation conditions of the ignition heat waves, and this can result in local melting of catalyst; these hot spots cannot be detected by measurement of the gas phase temperature. The transient reactions can lead to the failure (melting) of Pd alloy getter gauzes (for the recovery of Pt which volatilizes as PtO_2). The problems associated with ammonia surge, high concentration of NH_3 in the feed, fluctuations in the feed, etc. have been analysed. The laboratory simulation experiments were done. (**Ind. Eng. Chem. Res.** 1989, **28,** 1-5).

Liquid phase condensation of benzene with formaldehyde to diphenylmethane (DM): Zeolites as catalyst

Climent **et al.** have shown that large-pore zeolites are suitable catalysts for the reaction under reference and provide good conversions and selectivities. A variety of catalysts HY-21, HY-50, HY-100 etc. at different levels of Na^+ exchange were used; temperature of the reaction was 30-80°C. (Applied Catalysis 1989, **51,** 113).

Higher aliphatic alcohols from synthesis gas

Phillips Petroleum has revealed a catalytic process which give 2-8 carbon atoms alcohol with selectivity around 30-60%. It is a two-stage process where the first catalyst is a mixture of Co, Co oxide and MgO and the second consists of Cu, Cu oxide and zinc oxide. The reaction is conducted at 250-350°C and pressure of 35 to 105 atm. (*Process Eng.* 1989, April, p. 28).

Selective chlorination of phenol

Rhone-Poulenc have claimed that chlorination of 2,4 dichlorophenol, in the presence of tetrabutylammkonium chloride, gives 99.3% 2,4,6 trichlorophenol at 100% conversion. (EP 299891, Jan., 1989, *Cf. Chem. Abstr.* 1989, **111,** 7052).

Bisphenols

Idemiktsu Kosan have claimed that thymol when reacted with acetone, in nitromethane as a solvent, with HCl as a catalyst gives 2,2-bis (2-methyl-4-hydroxy-5-isopropyl) propane with 98.2% selectivity. (J.P. 63303940, Dec. 1988, *Cf. Chem. Abstr.* 1989, **111,** 7053).

Purifiction of 2,4 xylenol

Mixtures containing 2,4 and 2,5 xylenols can be treated with aldehydes (e.g. HCHO) in the presence of Lewis acid when the 2,5 isomer reacts selectively. Thus a 94% 2,4 and 6% 2,5 isomer can be purified to give 98.0% 2,4 isomer. (J.P. 6403136, Jan., 1989, *Cf. Chem. Abstr.* 1989, **111,** 7054).

Benzaldehyde to stilbene in a two-phase system

The Wittig reaction has been carried out by Wang **et al.,** in a two-phased system using CH_2Cl_2 and aq. NaOH with benzyl triphenyl phosphonium chloride which acts both as a PTC and a reactant getting converted to triphnyl phosphine oxide. The yield of stilbene as high as 95% could be realised and the product has a *cis* content of 66.3% (which in turn is more expensive than the *trans* isomer). (*Chem. Eng. Commun.* 1989, **79,** 189-205).

Continuous counter-current moving bed separator (CCCMBS)

Fish, Carr and Aris have made a study of continuous chromatographic separation of a mixture of 1,3,5 trimethylcyclohexane and 1,3,5 trimethyl benzene (TMB) (which is more strongly adsorbed) at 200°C in a 1.37 cm i.d. 2.4 m long time. Feed was introduced at mid point of the column. The solid particles were 30 mesh alumina and relative solids and carrier gas flow rates were adjusted. At low flow rates pure components were obtained at the top and the bottom. However, at suffi-

ciently high flow rates TMB was transported upwards as well as downwards and top product purity deteriorated. This behaviour was found to be in quantitative accord with the predictions. (*A.I.Ch.E. Jl.* 1989, **35,** 737).

Counter-current (CC) extraction in a rising film column (RFC)

He and Baird have reported results from a 5cm dia. CC extraction column, operated in the film flow regime; the film was supported by vertical Teflon wires (0.80 mm dia.) or perforated Teflon plates. For systems of high interfacial tension RFC seems to be superior to packed and spray column. The value of true mass transfer coefficient with water-acetic acid-kerosene was found to be in the range of 3 to 5 x 10^{-3} cm/sec. (*Chem. Eng. Res. Des.*, 1989, **67,** 96).

1-Bromo-2-Fluoroethane

The title compound can be made by the reaction of $BrCH_2CH_2Br$ with HF in sulfolane with Cu_2O as a catalyst; temp. 100°C. 93.5% selectivity at 69.7% conversion has been claimed. (J.P. 63,384,138, Nov. 1988, *Cf. Chem. Abstr.* 1989, **111,** 6916).

Simultaneous preparation of 2,3 dimethyl butyric acid and tert butyl chloride

Sumitomo have claimed that isobutylene can be reacted with vinylidene chloride in the presence of sulfuric acid as a catalyst at -5°C. (J.P. 663,222,130, Sep. 1988, *Cf. Chem. Abstr.*, 1989, **111,** 6927).

Separation of *alpha* and *beta* naphthalene suphonic acid

A biochemical method has been developed by Ishikawa, **et al.,** to separate alpha and beta naphthol in which a separator caries out selectively the hydrolysis of *beta*-naphthol sulfate. It will be necessary to upgrade both *alpha* and *beta* naphthols. A sulfatase bound membrane is recommended. (*J. Chem. Eng., Japan,* 1989, **22,** 18-24).

Dihydroxylation of alkenes with H_2O_2 in two-phase system

Venturello and Gambaro have proposed a simple method where water soluble vicinal diols are formed from water insoluble alkenes. Here tungsten peroxo complexes are used as a catalyst. Thus $PhCH(OH)CH_2(OH)$, obtained from styrene can be converted to phenyl acetaldehyde. Solvent like benzene/toluene can be used and yields as high as 88% have been realised. (*Synthesis* 1989, April, p. 295).

Clay Catalysis: Cyclic ketones to enolthioethers

Montmorillonite KSF catalyses the reaction under reference, e.g. cyclohexanone + RSH, in refluxing toluene, giving 25-81% yield. (*Synthesis* 1989, Feb. 143).

Alkyl carbamates from alkyl isocyanates and alcohols

Cuprous chloride catalyses this reaction and yields as high as 96% have been realised. This is a mild and efficient method and works with hindered alcohols as well. (*Synthesis* 1989, Feb. p. 131).

Electrochemistry: a short cut for the organic chemist

Chaussard (of SNPE, France) has given a succinct account of this subject. Most of the recent successes have been concerned with electrooxidations in place of those based on expensive and/or polluting oxidising agents. Typical examples are Maltol; anisaldehyde; damascone. Electro reductions have not made a dent as a breakthroughs in catalysis have circumvented many problems. However there are situations where catalytic reductions is inefficient and here electroreduction gains importance. Examples: 1-Cysteine for cystine. The use of aprotic solvents is now gaining impportance; new carbanion chemistry for reduction is likely to be successful industrially. Organo halides can be converted to aldehydes/acid/ketones. The adoption of electrochemical transformations in place of those based on organometallic compounds confers a number of advantages associated with safety, cost, milder conditions etc.

Highly selective monoelectro carboxylation of poly halogenated compounds is possible; conversion of 1,2,5 trichloro benzene to 2,5 dichloro benzoic acid; *p*-fluoro bromo benzene to *p*-fluoro benzoic acid, etc. Dimethyl benzyl carbinol from benzyl chloride and acetone has pleasant rose scent.

Some promising results now emerging are: (i) introduction of various metals or metalloids from a consumable electrode into organic compounds resulting in new syntheses of organocadmium, organozinc, organosulfur, etc. compounds. (*Performance Chem.* 1989, June, p. 10-12).

[Olin has an electrochemical route for hydrooxylammonium nitrate, which is a major component in a liquid propellant. *Chem. Week,* 1989, 17th May, p. 28).

Methanol to isopentane with ZSM-5 having one-atomic layer ZrO_2

Askura **et al.,** have shown that the modified ZSM-5 catalyst is a unique one which allows this difficult conversion. (*Catal. Lett.*, 1988, **1,** (No. 11), p. 395).

Fertiliser intake: UP crosses 2 MT mark

Uttar Pradesh is the first State to cross the two-million tonne mark in fertiliser consumption in the country following its record utilisation of 2.13 million tonnes of chemical nutrients during 1988-89.

Andhra Pradesh, with an impressive 41.4 per cent higher consumption has pushed Punjab to the third position, according to the just released annual review of fertiliser production and consumption by the Fertiliser Association of India (FAI) for 1988-89.

The review gave off an alarm at the virtual stagnation of Punjab's fertiliser consumption at 1.11 million tonne level during the last three years. It called for a "careful analysis and corrective steps" to remove bottlenecks in increasing fertiliser use in Punjab.

Andhra Pradesh succeeded in pushing up its total fertiliser consumption from 901,500 tonnes in 1986-87 to 966,700 tonnes in 1987-88 and 1.36 million tonnes in 1988-89. Thus it also became the third State to cross the one-million mark.

The fertiliser consumption in some of the major States during the year, described to be one of the best rainfall year, is as follows (in tonnes): Gujarat (589,000), Haryana (510,000), Karnataka (799,000), Kerala (213,300), Madhya Pradesh (684,100), Maharashtra (850,300), Rajasthan (301,000), Tamil Nadu (742,500) and West Bengal (632,400).

The review noted that the all-India consumption of fertilisers crossed the ten-million mark in 1988-89 following a 26.1 per cent increase in the consumption over the previous year (1987-88).

The total consumption of 10.96 million tonnes achieved during the year under review is a 2.27-million tonne increase over 1987-88. This surpassed the previous highest increase of 1.32 million tonnes witnessed in 1983-84 when there was a 20.7 per cent growth.

STC WANTS TO HANDLE FERTILISER IMPORT

State Trading Corporation (STC) has made a representation to the Commerce Ministry for diverting import of fertiliser from the Minerals and Metals Trading Corporation (MMTC) to STC. STC has urged that MMTC be restricted to handle canalised and non-canalised trade of metals and minerals only.

It has suggested that canalised import of sulphur and fertilisers should be transferred to STC. In fact, the STC has made a strong case for handling all agriculture-based commodities as it has the expertise. STC has also urged canalisation of import of thermoplastics, caprolactum and wood pulp through it.

TAC bid to come out of the red

The joint sector Tuticorin Alkali Chemicals and Fertilisers Ltd. (TAC) bids fair to come out of the red in another four years' time, going by its improved performance of late. The company has been making profits in the last couple of years. In 1987, it made a net profit of Rs. 4.06 crores. Again, for the 15-month period ending March 31, 1989, TAC notched up a profit of Rs. 1.17 crores.

But, despite this turnaround in its fortunes, the company has yet to wipe out the accumulated losses which as of now stand at a staggering Rs. 9.60 crores. Consequently, the Board of Directors has decided to skip the dividend for the year.

According to Mr. B. Vijayaraghavan, Vice-Chairman and Managing Director, the plant at Tuticorin has been working at optimum capacity utilisation levels, and he is confident of making a profit of Rs. 2.5 crores per year over the next four or five years, making good the accumulated losses.

He, however, asserts that the company is not to be blamed for the past ills. For one, the Centre had, in the beginning, set its face against TAC's demand for allowing the normal retention price for ammonium chloride, the high-value fertiliser produced by the company.

The retention price was eventually fixed on April 19, 1985. But, in the meantime, TAC was forced to sell the product at a price which worked out to just half the production cost. In fact, the company could make a net profit of Rs. 4.06 crores in 1987 only after taking into account the earlier year's subsidy.

The new net retention price, effective from April 1, 1988, has yet to be fixed as the Bureau of Industrial Costs and Prices has not completed its study before making the recommendation to the Government. As a result, TAC has had to account for the subsidy on the basis of the old retention price.

TAC is now facing another crisis. A shortage of ammonia has resulted in the shut-down of the fertiliser plant. Till August-end, there has been a production loss of 46 days. This is said to have come about because of the Centre's delay in making arrangements for import of essential inputs as also the uncertainty over shipping schedules.

Besides, the ammonia supply from the neighbouring SPIC, which is about 1000 tonnes per month accounting for TAC's requirement for 15 days, could not be maintained due to a normal shut-down of that plant. It is feared that, in all, there will be a production loss of 65 days which would mean a loss of Rs. 6 crores. With the scheduled arrival of a ship carrying ammonia shortly, normal production is expected to resume.

During 1988-89, the company's production of soda ash touched 69,380 tonnes compared to 49,980 tonnes in 1987, while ammonium chloride output amounted to 64,010 tonnes (46,360 tonnes). The sale of TAC's detergents doubled during the period reaching a level of 4,402 tonnes. The market, so far confined to Tamil Nadu and Kerala, is proposed to be extended to cover Andhra Pradesh and Karnataka. The company has also started developing captive salt works adjacent to the plant to meet its requirements. In the first two years, 100 acres is planned to be developed and another 200 acres over the following two years.

NEW DRUG FROM CADILA LAB

The Ahmedabad-based Cadila Laboratories, the second largest pharmaceutical house in the country, has come out with "enalapril", an anti-hypertensive drug under the brand name "Envas". A second generation ace inhibitor, the new drug has revolutionised anti-hypertensive therapy, says a company release. So far, enalapril was being imported.

OIL to raise $60 m from global market

Oil India Limited (OIL) is to raise a commercial loan of $60 million from the international market. The company has not yet made up its mind on the currency in which the loan is to be contracted which would depend on terms and the fine rates to be available. Negotiations with Kuwaiti banks to raise the loan in Kuwaiti dinar are believed to be in progress. The deal, according to informed sources, is to be clinched before the end of this year.

The loan may be used for financing OIL's ventures abroad, it is learnt. According to recent reports, the company is now examining the scope of joint ventures with foreign companies for undertaking exploration activities in South-East Asian countries like Thailand and Malaysia and also in Papua New Guinea. OIL has been toying with the idea of going abroad. A few years ago it received a proposal for undertaking activities in Indonesia. However, the proposal was not attractive enough and hence it did not make much headway.

Earlier in 1987, OIL had taken World Bank assistance of the order of $140 million to be used over a period of seven years, mainly for production improvement. The utilisation level by the end of the current financial year is estimated to be of the order of $ 45 million. So far the money has been used for financing exploration activities in Rajasthan and north-east region, particularly Arunachal Pradesh.

The World Bank loan, according to informed sources, has to be used up fully by September 1994. In other words, the company has to spend about $ 95 million in less than three years. That should not be much of a problem, the sources observe. The company's hands are full with schemes already approved by the government. OIL's plan to raise commercial loan in the international market, company sources assets, should not be construed as reflection on its financial strength. Political agitation and floods which hit production and transportatiion did not affect the company's overall performance.

In 1988-89, OIL achieved a net profit of Rs. 86.56 crores, up from Rs. 66.38 crores in the previous year. Gross profits for the corresponding periods were Rs. 102.55 crores and Rs. 93.11 crores respectively. The turnover in the last financial year touched Rs. 533.59 crores against Rs. 519.12 crores in the year before that. The equity of the company is Rs. 28 crores and reserves and surplus Rs. 500 crores.

Almost the whole of total outlay of Rs. 950 crores in the Seventh Plan was financed through internal generation of the company. By the end of the plan, the additions to reserves is estimated to be 155 million tonnes of oil or oil equivalent of gas. During the same period, OIL will have drilled 61 exploratory and 128 development wells.

In the Eighth Plan, of a total outlay of Rs. 1,750 crores, about Rs. 1,405 crores will be funded from within the company. The thrust of the next plan will be directed towards exploration, field development and capital asset creation. In the Eighth Plan, OIL plans to add about 185 million tonnes of oil and oil equivalent of gas and drill 95 exploratory and 194 development wells. "However, all projections for the Eighth Plan are tentative, as final figures are yet to be worked out", add OIL sources.

DRUG COMPANIES HIT

Pharmaceutical companies making syrups and liquid preparations are in a tight spot with the spiralling prices of sugar in the open market. Drug companies are not entitled for any levy quota.

Industry sources at Bombay said that although sugar prices has touched Rs. 12 a kg in the open market, the government is still allowing a cost of only Rs. 6.50 a kg on all drug preparations. This price was fixed several months ago.

Seventh Plan target of crude oil output may be exceeded

India's cumulative production of crude oil during the Seventh Plan Period (1985-90) is likely to be 157.387 million tonnes.

An official review of the oil sector's performance during the period said that the achievement of the Oil and Natural Gas Commission (ONGC) was likely to be 144.497 million tonnes or more against a target of 143.64 million tonnes.

In the case of Oil India Limited (OIL), the likely achievement is estimated at 12.89 million tonnes against a target of 15.5 million tonnes, which was later received down to 14.9 million tonnes. The review has also taken note of the fast increasing emphasis on the utilisation of gas for the fertilisers, power, petrochemicals and domestic sectors. In areas where gas production is picking up, there is a growing consciousness of establishing interim, fullback users, the report said.

According to the report, the proportion of gas utilised as a percentage of gas produced had risen to about 70%. The cumulative gas production for the Plan is expected to be about 58 million cubic metres, with the terminal year production reaching a level of 15 million cubic metres, he said.

The report said the performance of the seismic parties in both the organisations had been commendable, with their onland coverage likely to exceed the targets by significant margin (190 per cent). In offshore areas, ONGC was expected to achieve about 113% of the target.

In the area of exploratory drilling, the report said that against a target of 2.82 million metres, only about 2.43 million metres (86%) was likely to be accomplished. While ONGC was expected to achieve 95.5% of the target in development drilling, OIL might fall short by 28%, the report said. According to the report, the exploration strategy intended to be followed in the Seventh Plan envisaged equal stress on category one and category two and three (taken together) basins.

Such a strategy was adopted primarily on the assumption that most of the category one basins had reached a matured stage in exploration and further efforts would only yield diminishing returns.

But with the discovery of Dahej and Gandhar in the Cambay basin and Neelam field in Bombay offshore, much greater stress was laid on category one basins than was originally intended. For ONGC, the original plan envisaged allocation of about 46% of the total drilling effort in category one basins and 54% in category two and three basins. The ultimate picture that is likely to emerge is significantly different. About 60% of the total exploratory effort was seemingly devoted to category one basins.

The report said the efforts made by ONGC in category two and three basins had paid rich dividends, particularly in the Krishna-Godavari, Cauvery and Assam-Arakan basins.

The review showed that though category two and three basins received somewhat lesser input than originally planned, the strategy was vindicated as significant discoveries of oil and gas had been made in these basins. The original plan envisaged that the data base in the case of category four basins would be enhanced in the first three-and-a-half years of the plan period to such a level that systematic exploration in these basins could start in the Seventh Plan itself.

KANDLA - BHATINDA PIPELINE

New consortium vies for contract

A consortium of French, Soviet and Indian companies has offered to execute the 1331-km Kandla-Bhatinda petroleum products pipeline on a turnkey basis. The leader of the consortium will be the French company GTM-Entrepose. The other members of the consortium are Sofragaz of France, Machinoimport of the USSR, and Birla Technical Services belonging to the C.K. Birla group.

With this there are now two international consortia with one Indian company each vying for the longest product pipeline in India. Earlier, Snamprogetti and Saipam of Italy, Spie Capag of France and Dodsal of India had reached an understanding to jointly bid for the pre-qualification of the Kandla-Bhatinda pipeline.

The new consortium has offered to provide French bilateral credit to cover 52.5 per cent of the project cost at two per cent interest per annum. This credit will be repayable in 30 years, including a grace period of 10 years and would cover the cost of equipment and services in the scope of GTM-Entrepose.

The rest of the 47.5 per cent of the project cost would be provided as an Organisation for Economic Cooperation and Development (OECD) loan in any currency on terms prevailing at the time of signing of the contract. The consortium has also offered to cover the cost of equipment and services from the Soviet Union in the form of commercial credit bearing interest at four per cent per annum and repayable after 10 years with payment in Indian rupees.

The leader of the consortium GTM-Entrepose and the Soviet member Machinoimport are likely to do the pipeline erection and engineering. Sofragaz, a subsidiary of Gaz de France Elf Aquitaine and nine French banks are expected to do basic and detailed engineering. Birla Technical Services will be doing project management and engineering.

Besides the two consortia, several other international companies are expected to bid for the project. The possible companies are NKK and Toyo Engineering of Japan, Hyundai of South Korea, Majestic and Novo Corporation of Canada and British Gas. The estimated cost of the project is Rs. 772.97 crores and is scheduled to be commissioned within 33 months from the zero date.

The project, which is now before the Cabinet Committee on Economic Affairs (CCEA), is expected to be financed from World Bank credit. The product pipeline is intended to meet the deficit of petroleum products in the north-west region of the country. It will have tap-off points at Sidhpur, Jodhpur, Jaipur, Rewari and a few other places.

In case the World Bank financing is available for the project, pipe line supply will not be covered by the World Bank tender. It is also likely that a separate tender will be issued for pipeline coating work since some of the Indian companies have set up coating facilities in India for the H-B-J gas pipeline and have represented to the government that they may not get work in case of a turnkey tender. The major part of the tender in case of World Bank financing will be the laying of the pipeline.

INDIGENOUS OILFIELD EQUIPMENT: TIME LIMIT ON PRICE PREFERENCE SUGGESTED

Placing of a limit on the time allowed to Indian manufacturers of oilfield equipment to come up to international standards has been suggested by the sub-group on oil exploration and development to reduce the financial burden on the Oil and Natural Gas Commission (ONGC) and Oil India Ltd.

While recognising the need for reducing dependence on foreign manufacturers and suppliers in a critical area like oil exploration and production, the sub-group has said that price preference should not be given to Indian manufacturers for an indefinite period. A limit of say five years should be fixed to enable the Indian manufacturers to establish themselves independently.

But, if indigenous prices continue to be more than the landed costs of imported items beyond this limit, a mechanism should be devised to mitigate the extra burden on ONGC and Oil India. The price of indigenous oilfield equipment has been found to be generally two to 53% higher in comparison to the lowest technically acceptable foreign offer after excluding customs duties, port handling and inland transportation charges.

The higher cost of indigenous components has been attributed to the high cost of inputs like steel, consumables, high cost of fuel, lack of infrastructural facilities, depressed world market scenario and limited domestic demand and extra cost by way of royalty and technology transfer fees. The subgroup has suggested that the Eighth Plan target of indigenisation of oilfield equipment and services be kept at 65 per cent against 54 already reached in 1987-88. Indigenisation cannot reach beyond a certain level due to obsolescence and high-technology, it has argued.

The thrust areas suggested for the Eighth Plan for indigenisation include development of adequate capacity for all sizes of casing pipes, development of indigenous capabilities for services like mud logging, well stimulation, equipment inspections and the like. The sub-group has estimated that the ONGC's savings of foreign exchange as a result of indigenisation efforts during the last five years could be about Rs. 2,500 crores. The indigenisation efforts by Oil India have resulted in saving of foreign exchange to the tune of Rs. 150 crores during the same period.

Manali Petrochem to go on stream by March

Manali Petrochemicals Ltd., the first project in the country for manufacturing propylene glycol and polyols, is all set to go on stream by March next year as scheduled. Promoted by SPIC, the company's plant at Manali near Madras, work on which is fast progressing, will have an installed capacity to produce 6,250 tonnes of propylene glycol and 6,000 tonnes of polyols per year. The plant has been so designed that higher production levels can be achieved, if necessary.

The total project cost is estimated at Rs. 101 crores, of which Rs. 29 crores will be by way of equity. SPIC will participate in the equity to the extent of Rs. 14.6 crores and an equal amount is sought to be raised through public issue.

SPIC is also extending a subordinate loan of Rs. 8.6 crores, taking its total contribution to around Rs. 23 crores. The balance amount will be met through loans from financial institutions led by IDBI.

Mr. R. Raghavendran, Managing Director, told newsmen at Madras recently that the company has obtained the licences for use of processes from Atochem, France, for propylene oxide and propylene glycol, and from Arco, US, for polyols. Both the companies are world-renowned in their respective fields. The licences have been provided by Technip of France.

Propylene glycol is a premium product in several pharmaceutical and cosmetic applications. Polyols are the basic material for polyurethanes which are extensively used in industries like automobiles, furniture, foam, insulation panels, sports goods, footwear, etc.

The country is presently importing its requirements of these products and, therefore, the company's production will be in the nature of import substitution. The current demand is put at 10,000 tonnes each per annum and it is reckoned to grow at the rate of 15%.

The plant is strategically located, in the vicinity of MRL and SPIC Heavy Chemicals, which ensures easy availability of raw materials. The company has entered into memoranda of understanding with MRL for supply of propylene and with SPIC Heavy Chemicals for chlorine.

Mr. Raghavendran said the turnover in the first year is expected to be in the region of Rs. 40 crores at 70 per cent capacity utilisation. Of this, the foreign exchange saving will be to the tune of Rs. 25-30 crores. The turnover is slated to touch Rs. 55 crores in the third year of operation when 100 per cent utilisation will be achieved.

Plea for petrochem project in Cauvery basin

The Tamil Nadu and Union Governments have been urged to take early steps to set up a petrochemical complex in the Cauvery basin where ONGC has discovered rich deposits of hydrocarbons. The suggestion came from Mr. M.A. Alagappan, who was presiding over the annual meeting of the Southern India Chamber of Commerce and Industry (SICCI) recently. In the light of the promising strikes in the past few years, there is great scope for petro-chemical industries in the region, he pointed out. Welcoming the steps the Tamil Nadu Government has taken to speed up the tempo of industrial growth in the State, Mr. Alagappan stressed the need for correcting a few anomalies that had still given an edge to other States over Tamil Nadu.

If the state is to attract industries, he said, the monetary ceiling of Rs. 3 crores as deferred sales tax for the first five years should be revised upwards. Some states, he asserted, are offering 90% of the capital invested with no such ceiling. Pleading for active state support to expansion and diversification plans of enterprises, he said, investment opportunities would be lost to other states unless care is not taken to follow-up applications.

The SICCI Chief also endorsed the State Government's move to offload their shareholdings in stabilised companies in a phased manner. This in his view would go a long way in meeting the Government's resource problem. He expressed the hope that Tamil Nadu would implement all power projects within the scheduled period. He also favoured a thermal plant in the state sector using lignite as the feedstock.

ONGC CROSSES ANOTHER MILESTONE

The Oil and Natural Gas Commision (ONGC) has started producing oil from a well in the fractured basement rocks of Bombay High field in the western offshore, a press release by the Commission said, recently.

The well is currently producing about 640 barrels of oil per day. The commencement of production of oil from fractured basement is considered to be a very significant landmark in exploration efforts.

Recently, a few exploratory wells were drilled by Oil and Natural Gas Commission exclusively for finding out presence of oil in the fractured-basement of Bombay High and Heera fields. In all these wells, good quantities ranging from 450 to 4,500 barrels per day of oil production was obtained during initial testing, production from the fractured basement, is under constant study.

This would help in drawing up a long-range strategy of completing old wells of Bombay High and obtaining additional production through the existing oil processing and transportation facilities thereby economising the whole project, the release said.

By now, 30 million tonnes of in-place reserves have been established in the fractured-basement of Bombay High and Heera fields. With additional data coming in, there is a great possibility of establishing large reserves of oil in Bombay High and Heera fields, the release said.

The breakthrough is a result of sustained research and development efforts, it said adding that the discovery of oil from fractured basement and its contribution to the production from Bombay High field has further brightened the prospects of this field.

The reserves of the field have already been upgraded and the life of Bombay High is expected to be prolonged further. Encouraged by the oil find in fractured-basement, ONGC has taken up exploration in other giant gas field — Basein, where too, oil and gas had been struck and further exploration efforts are on hand in this area, the release said.

The innovative exploration strategy and the applications of the new technologies is expected to contribute to enhanced production from the western offshore area from the present level of 21.60 million tonnes by the end of 1989-90 to 30 million tonnes by the end of the Eighth Plan.

ONGC had earlier found oil in the fractured-basement in upper Assam valley at Borholla-Changpand field. This field is already producing oil and gas from the fractured-basement rocks.

Recently, gas in commercial quantities was discovered off the coast of Tamil Nadu. Sometime ago in the onshore area of Andhra Pradesh, commercial gas production was obtained from fractured-basement rocks.

7 KILLED IN FERTILISER FACTORY FIRE

Seven persons were charred to death and 12 others suffered severe burns in a fire caused by the leakage of methanol fluid in the Fertiliser Corporation of India factory at Ramagundam in Andhra Pradesh, on September 17.

The condition of the injured who were admitted to the FCI hospital with over sixty per cent burns was stated to be serious.

The official said that the mishap occurred during the maintenance of the purification plant.

Additional medical personnel and equipment were requisitioned from the nearby National Thermal Power Corporation and the Osmania General Hospital in Hyderabad.

India may import Australian crude

India is likely to import crude oil from Australia for the first time to meet its domestic demand.

The Indian Oil Corporation (IOC) Chairman, Mr. S.L. Khosla said, in Singapore, on September 13, that negotiations with some Australian traders regarding the matter were going on. The deal was expected to be finalised after examining the sample crude and the profitability of its processing in the Indian refineries. Mr. Khosla said the whole process will take about four to five months.

Mr. Khosla, who was in Singapore, on a three-day visit as part of the Indian delegation to the Asia Pacific Petroleum Conference (APPEC) said India wanted to get the 'maximum economic advantage', from the present situation in the oil market.

Mr. Khosla said, recently India imported 250,000 tonnes of oil from Malaysia. A similar quantity of crude oil was imported by India from Malaysia last year too.

The crude was of good quality and like the Bombay High, was suitable for processing in the Indian refineries, he said. The total import of crude oil this year would be around 18 million tonnes with the total domestic production of oil going up to 32 million tonnes.

Mr. Khosla said, India imported six million tonnes of petroleum products with the total demand being 53 million tonnes.

He said the present oil prices in the world market were expected to rule steady during the remaining part of this year.

This was also the impression gained by the Indian delegation after meetings with representatives of leading world oil companies.

The meetings, Mr. Khosla said, were useful and India was able to appraise itself of the latest developments in the field of petroleum industry.

Such international conferences provided ample opportunities for exchange of views in the field.

The other members of the Indian delegation included, Mr. H.C. Gupta, Joint Secretary in the Ministry of Petroleum and Natural Gas, Mr. H. Laxman of the Madras Refinery, Mr. A.S. Mani, General Manager IOC and Mr. Tejpal Singh of Caltex, New Delhi.

Speakers at the APPEC, which began its deliberations on September 11, in Singapore, emphasised the need for maintaining the oil price without much fluctuations. The three day meeting concluded on September 13.

ALUMINA PROJECT IN MAHARASHTRA

Essar may tie up with French company

Aluminium Pechiney of France, which has been Nalco's collaborator for the giant alumina/aluminium complex in Orissa, is now likely to join hands with the Essar group for setting up a hundred per cent export oriented alumina project, proposed to be set up in Maharashtra at an investment of about Rs. 600 crores.

The Bombay-based Ruias have recently secured "in principle" okay of the Projects Approval Board for a 400,000 tonnes per annum capacity alumina project in Ratnagiri district — the very place where Balco, the other public sector aluminium giant, once wanted to put up a big project. The proposed project will be taken up by Essar Investments Ltd.

As inquiries reveal, the alumina that the Ruias intend producing in Ratnagiri would be taken to suitable locations in the Gulf countries for further conversion into aluminium. This arrangement is being contemplated keeping in view the idle smelting capacity in the Gulf.

Corporate watchers find the Essar group's move to diversify its operation into alumina/aluminium sector is judicious as this new line of business will provide an opportunity to this group to expand its manufacturing operation in aluminium-based products. However, for the last two years, export of metal grade alumina to smelters abroad has become one of the major foreign exchange earners for the country. All this is being done by exploiting the bauxite deposits available on the east coast, while the vast proven deposits on the west coast still remain untapped.

Keeping this in view, the Ruias have proposed to locate the plant on the west coast to utilise bauxite from the Dhangarwadi group of mines in Kolhapur district. The site of plant has been selected at Ratnagiri because this being an export oriented unit, would have the added advantage of a port location. It is expected that necessary port facilities and infrastructure would be ready before the plant starts commercial production.

Feasibility report of the project indicates that apart from providing direct employment to about 800 persons in the plant and another 500 persons in the bauxite mines, the project is estimated to provide indirect employment to over 300 persons in the area. Moreover, a substantial number of small and medium scale ancillary industries, repair workshops and garages are expected to be established in the region to support the project.

Mr. Ravi Ruia, managing director of Essar Gujarat Ltd., said that the proposed alumina project would be able to earn about Rs. 750 crores in foreign exchange in the first five years of production against a foreign exchange outflow of about Rs. 200 crores as project cost. This project, for which a detailed report is now being prepared would employ the Bayer process with digestion at atmospheric pressure and temperature. According to him, the plant would be ready for commercial production within 36 to 42 months after all the clearances are obtained from concerned authorities.

In reply to a question, Mr. Ruia said although it was a new line of business, there would be no problem of implementing the project because it had already acquired experience through setting up the world's largest hot briquetted sponge iron plant at Hazira which is expected to be commissioned in early 1990. In line with the corporate policy, the Essar group had proposed to go international by setting up an export oriented steel plant with a capacity of 800,000 tonnes per annum to earn foreign exchange by using locally available raw materials — iron ore, pellets, gas — and adding value to them. Similar to the steel plant, the proposed alumina project would procure all materials and consumables indigenously.

Mr. Ruia disclosed that the group was considering to explore the possibility of setting up mineral-based projects in eastern region of the country. In fact, an expert team would soon be sent to Orissa to make the on-the-spot study as well as to identify the prospective projects there. Regarding prospective technical collaborator of the alumina project, he said that a few rounds of discussions had already taken place with Aluminium Pechiney and in all likelihood this French company would be associated with the project.

USHA'S BID FOR HBI PLANT AT VIZAG

In order to consolidate its overall strength in the hot briquetted iron (HBI) market, Usha Rectifier has made a bid for setting up a HBI plant at Visakhapatnam in the joint sector with APIDC. The project will also include setting up of a pelletisation plant based on Bailadilla iron ore mines.

The proposed project is likely to have the participation of SAIL and the size of the project will be the same as that of the gas-based HBI project complex planned at Amethi at 8 lakh tonnes capacity per annum.

Addressing newsmen at Hyderabad recently, Mr. Vinay Rai, Chairman and Managing Director of the company, stated the Vizag project would cost around Rs. 600 crores and will have the advantage of being a forerunner in HBI projects. A separate company will be formed to set up the Vizag project and it will be finalised in about four months time, Mr. Rai said.

Speaking on the Rs. 1,500-crore steel complex at Amethi, Mr. Rai stated Engineers India Ltd. and Dastur and Company have been drafted as consultants. Process technology is that of Midrex Corporation of the USA while negotiations are on with Voest Alpine of Austria and Lurgi Gmbh of West Germany.

It is expected that the project will go on stream by January 1992 and will cater to the entire north Indian market. SAIL has already committed to buy 300,000 tpa from the company on a long term basis.

L & T proposes Rs. 1080-cr. bauxite project in AP

Larsen and Toubro Ltd. has sought Government approval for setting up a Rs. 1080-crore project to exploit the vast untapped bauxite deposits in Andhra Pradesh.

The project, tentatively sited at Krishnadevipeta in Visakhapatnam district, is to be implemented by a new undertaking which will form part of the L and T group. It will manufacture one million tonnes of sandy alumina, the intermediate in the manufacture of aluminium.

The company has told the Government that it is willing to consider any other location based on the availability of raw materials. Andhra Pradesh has abundant deposits of bauxite, the basic raw material. During the 1970s, two projects were proposed, one in Orissa and the other in AP to exploit the bauxite deposits. The Orissa project alone fructified, leading to the creation of National Aluminium Company Ltd. (NALCO), with French collaboration.

The AP project, which was to come up with Soviet assistance, never saw the light of the day. L and T's idea appears to be to export alumina to the Gulf countries where smelting costs are lower because of cheaper fuel.

The project will have an annual turnover of approximately Rs. 470 crores. The company plans to raise Rs. 810 crores by way of term loans, debentures and foreign currency loans and another Rs. 270 crores through international generations and a public issue.

According to industry pundits, India has the potential to emerge as a major exporter of aluminium in the near future. The public and private sector plants in the country produced 35,500 tonnes of the metal during August, 1989 which is 500 tonnes more than the July output.

Out of the total production, Bharat Aluminium Company (BALCO) produced over 8,000 tonnes while Hindustan Aluminium Company (HINDALCO) produced about 10,250 tonnes and National Aluminium Company (NALCO) 10,880 tonnes.

The cumulative production of aluminium during April to August 1989 has been 1,72,535 tonnes which is 40,657 tonnes more than that of the corresponding period last year.

NEED TO DEVELOP MINING EXPERTISE STRESSED

The Minister State for Science and Technology, Mr. K.R. Narayanan, has stressed the need for building expertise in the field of mining and mining technology.

Inaugurating a workshop organised by the Confederation of Engineering Industry (CEI) at New Delhi on September 16, Mr. Narayanan said India has the knowhow and technology in different areas, except in the field of mining. A CEI release quoted him as saying that greater stress needs to be given to certain sectors so that the country forges ahead in the scientific and technological field. Mr. Narayanan said close association of the Department of Ocean Development, research laboratories and engineering industry could lead to fulfilling India's dream of achieving excellence in the field of mining.

Prof. V.K. Gaur, Secretary in the Department of Ocean Development, said India has enormous strength in technology and in some fields it is comparable to international standards. "One weak area was mining," he said. In his key-note address, Dr. A. Gopalakrishnan, Director, Central Mechanical Research Institute, Durgapur, said there was need for detailed examination of the seabed mining site to identify the locations which were abundant in nodule deposits of the right grade.

Data on several other parametres of ocean bed were needed to be collected for developing appropriate mining system for the next phase of operations, he added. He said exploitation of the seabed resources offered enormous opportunities for the corporate sector to diversify into new and profitable ventures.

TISCO TO INCREASE CHROME ORE OUTPUT

Tisco is pumping huge investment out of its own funds for increasing the capacity of chrome ore production in Orissa. Under the proposal, the company will invest some Rs. 22.30 crores to increase the capacity from the present 2 lakh tpa of 3 lakh tpa at its existing plant located at Sukinda in Cuttack district of Orissa.

The company has also been told to undertake an export obligation of 60 per cent of the expanded capacity by the government. The expansion of capacity was prompted by the fact that apart from the high grade chrome ore that the company is able to extract from the Sukinda mine huge quantity of low grade chrome also comes out which in effect is a waste.

In its application to the government Tisco has proposed upgradation of this inferior variety of chrome by beneficiation which will result in increasing the Cr_2O_3 contents of the ore to more than 45 per cent which will then be useful for industrial use.

The company has also explained to the government that the feedstock material will be arising from the existing mining operations as well as freshly mined low grade ore.

Tisco also told the government that after benefication it would be in a comfortable position to export substantial quantity annually.

UNITS WITH 100% EXPORT OBLIGATION:

Delicensing on cards

The Government has in principle agreed to delicense all units with 100% export obligation. According to Udyog Bhavan sources, the Industry Ministry has given the nod to the Commerce Ministry's proposal for delicensing all units with 100% export obligations. The relevant details are now been worked out.

The Government is also considering to allow the 100% export units to take on lease idle capacity to meet the export order. All 100% export units are currently exempted from the provisions of MRTP Act under Sections 21 and 22. However, leasing units for exports are not exempted from the Act.

The Department of Company Affairs is now contemplating amendments whereby the leasing of idle capacity for 100% export obligation be exempt from the provisions of the Act. In fact, the Department, pending amendments to the MRTP Act has proposed to introduce a new simplified procedure on leasing idle capacities for export purposes. Under Section 23(4) of the MRTP Act, 1969, prior approval of the Government is required, particularly by MRTP companies, to take on lease idle capacity of other units. This involved a lengthy procedure of advertising in the press, seek objections and have a hearing in the Department.

It also affected the delivery schedule in case of an export order. Hence, the department has proposed to dispense with the requirement of issuing a public notice if an application is made to the Administrative Ministry alongwith a simultaneous application to the Company Affairs.

The Government has, however, rejected the proposal to club the third party exports of FERA companies with the manufactured exports for the purpose of meeting export obligation. Though the Commerce Ministry had pursued the matter at the instance of industry's request, the Department of Revenue did not accept the same. However, the Ministry has decided to rediscuss the matter to ensure that in certain cases where additionally of exports could be ensured, such third party exports be counted for fulfilment of export obligation of new products and export to new markets.

The delicensing of units with 100% export obligations is a result of deliberations held between the Commerce Ministry and Industry at the Board of Trade meeting. The board has representation from all the Government departments which helps in taking quick decisions. The proposal for delicensing was put forward by the Associated Chambers of Commerce and Industry (Assocham) in the first Board of Trade meet. This was later pursued by the Commerce Ministry with the Ministry of Industry at the highest level. The Industry Ministry subsequently agreed to delicense such units. The details are now being worked out and will be finalised soon, the sources said.

At present, units with investments up to Rs. 50 crores in the backward areas and Rs. 15 crores in other areas are exempted from licensing. The number of industries requiring licences has been reduced from 75 to 26. About 72 specific industries and 30 group of industries have already been delicensed for MRTP/FERA companies and non-MRTP/non-FERA companies, respectively.

SOLAR PLANT FOR RAJASTHAN UNDER STUDY

The Union Minister of State for Energy, Mr. Vasant Sathe, said on September 7, that the Government was considering a proposal to set up shortly a 30 MW solar energy plant, most probably in Rajasthan. Underlining th need to earmark substantial funds for th development of non-conventiona energy sources in the coming plans, th energy minister said that the return o the investment made in this crucia sector had been quick due to the shor gestation period and, negligible mainte nance and recurring cost of such pro jects. These projects were pollution fre as well, he added.

Mr. Sathe, who addressing a meetin of the Department of Non-Conventiona Energy Sources in New Delhi, said tha against the allocation of about Rs. 50 crores for this sector in the Seventh Plan, the benefits had been of the orde of over Rs. 700 crores. Moreover, the benefits from the non-conventiona energy sources had percolated to a very large segment of population living in rural, tribal, hilly and remote areas Mr. Sathe said.

He said that the integrated rural development was closely related to the rural energy development. In this connection, he drew attention to the rapid development and popularity of bio-gas bio-mass and solar energy projects in rural areas. The number of bio-gas plants, both family size and community plants, improved chulhas and biomass gasfires had increased manifold in the recent years, Mr. Sathe said.

VAGRA PETROCHEM PROJECT TO BE CLEARED SOON

A Rs. 2,200-crore petrochemical complex being set up at Vagra in Broach district was expected to be cleared shortly, the Energy and Industry Minister, Mr. Harisinh Mahida, said in Gandhinagar, recently.

The clearance for three gas-based power stations was expected shortly Mr. Mahida said, adding that there would be two 600 mw power stations in South Gujarat and another 750 mw power station at Pipavav in Saurashtra region.

Items imported under OGL can be exported

The Commerce Ministry has decided to allow re-export of items imported under the open general licence (OGL).

For the purpose, the Ministry would issue advance trading licence to established exporters to import items duty-free under OGL for re-export purposes with a minimum 10 per cent value addition. However, such exports would not be entitled for any export benefit.

The scheme is proposed to be brought into effect in the new import-export policy. The present policy expires on March 31, 1991. At present, the items covered for import under OGL are generally not allowed to be exported as a matter of Government policy.

In the beginning only the established trading and export houses would be granted the advance trading licence. The Ministry has prepared a detailed paper on the issue to be incorporated in the new import-export policy.

According to the paper, the new scheme would be introduced with the concept of allowing trading on the imported raw materials with a view to earning foreign exchange. The Ministry is contemplating several other measures in a bid to boost export earnings. The general thinking in the Ministry is to create an 'export bias' vis-a-vis domestic trade.

The Ministry has also agreed to allow export of commodities which are in marginal shortage in the domestic market to earn foreign exchange. In a situation of marginal shortage in domestic market the Ministry halts exports of such item. However, now the Ministry is considering to allow export of such items like aluminium and viscose staple fibre.

The Ministry is making an attempt to create an export bias by reducing the gap between the domestic sales profitability and the profitability on export sales.

The Ministry has pointed out that the cumulative effect of the various concessions given to exporters like duty drawback, CCS, concessionary interest rate, income-tax exemption etc. has reduced the differential between the profitability of domestic sales vis-a-vis export sales. Although considerable progress has been made to reduce the relative profitability gap, domestic profitability is still higher than export profitability for various manufactured exports and trading items, the Ministry has observed.

Hence, further policy measures would be necessary to increase the export bias, the Ministry has pointed out. The trading in imported raw material or various other items would be a meaningful step in this direction. The idea is to remove all restrictions on the corporate sector if it wants to re-export the items it has imported.

The Ministry has projected 38.2% growth in exports in 1989-90 in rupee terms, 21.2% in US dollar terms and 15% in volume. The incremental exports have been pegged at Rs. 7,744 crores in rupee terms and at $ 2,980 million in dollar terms. The total exports are projected at Rs. 28,025 crores during the year.

INDIA SIGNS FOUR AGREEMENTS WITH UNDP

India recently signed four agreements with the United Nations Development Programme for availing assistance of over $ 7.27 million for implementing four projects at New Delhi.

The four agreements with United Nations Development Programme were signed by Mr. S. Varadachary, Joint Secretary in the Finance Ministry and the resident representative of UNDP at New Delhi, Mr. Gamil M. Hamdy.

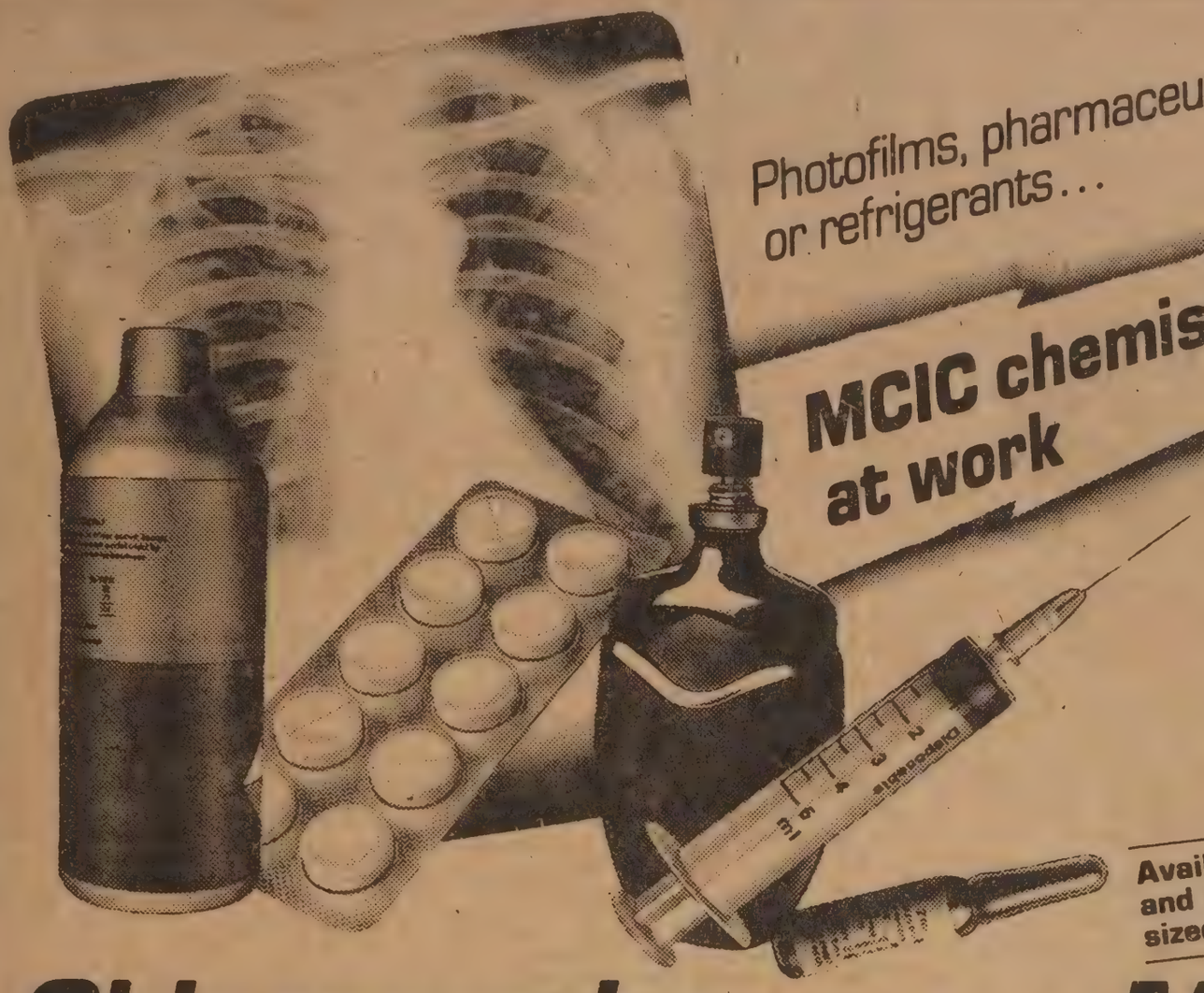
The agreements are for strengthening of Pesticides Development Centre (Phase-II) for an assistance amount of $ 2.18 million, development of special facility for electronic packaging technology and ergonomics design ($ 2.79 million), assistance to non-wood based pulp and paper industry ($ 1.9 million) and management consultancy development (Phase-III) for an assistance amount of $ 400,000.

The pesticides project will be implemented by the Departement of Chemicals and Petrochemicals through Hindustan Insecticides Limited and executed by UNIDO. The second project would be implemented by the Department of Electronics through the Centre for Electromagnatics and aims at developing a special facility called the Centre for Electronic Packaging Technology and Ergonomic Design.

The third project will be implemented by the Industry Ministry through the Central Pulp and Paper Research Institute, Shaharanpur. The fourth project is to be implemented by the Planning Commission and executed by the International Labour Organisation to develop and strengthen in-house management consultancy services in six state electricity boards and state road transport industries.

EXCEL HIKES ENDOSULFAN PRICE

Excel Industries Ltd. has hiked the price of endosulfan, a widely used pesticide in the country to Rs. 125 per kg from Rs. 120. This is the second price revision by the company during this year. The company has justified the price hike on the ground that the cost of imported raw materials required for the production of endosulfan technical had gone up recently because of rupee depreciation against the dollar.



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SPOTLIGHT ON

Biotechnology and Life Sciences (Part 2)

GENETIC ENGINEERING PROMISES PLANTS WITH BUILT-IN FERTILIZERS IN FUTURE

Crops of legume family, such as peas and beans, are exceptional in having their own built-in 'fertilizer factories'. These 'factories' are comprised of the colonies of bacteria in the roots (of plants) that can convert atmospheric nitrogen into usable ammonia.

If genetic engineers could transfer the ability of the legumes to fix nitrogen into other crops, such as wheat, the economic implications on agriculture would be enormous. The environment would benefit too, the 'home-grown' bacterial fertilizers, unlike artificial nitrate fertilizers do not leach out of the soil to pollute ground water and rivers.

Before researchers can transfer nitrogen-fixing ability to other crops, they need to understand the relationship between the bacteria, which are known as rhizobia, and their plant hosts. When rhizobia infect the roots of legumes, the plant responds by developing small out-growths, or nodules. Within these nodules, the bacteria enjoy an aerobic environment, supplied with food by the plant.

This intimate relationship is highly specific. A given strain of rhizobia can infect only certain groups of legumes, which are known as 'cross-inoculation groups'.

Legumes in the same cross-inoculation group have certain biochemical properties in common, concerning a type of protein known as lectin. Lectins bind to polysaccharide molecules (chains of sugars) and are specific for certain pairs of sugars. One type of lectin will bind glucose-galactose, for example, while another will bind over glucose-mannose.

Species of legumes in the same cross inoculation group have lectins specific for the same sugars. This suggests that these proteins are vital to the interaction between the host plant and the rhizobia, perhaps by binding to the polysaccharides found on the surface of the bacteria.

To confirm this crucial role, researchers at the University of Leiden in the Netherlands transferred the gene for the lectin found in peas into clover roots. All peas belong to one cross-inoculation group, which also includes vetches and lentils. The bacterium that infects this group is Rhizobium leguminosarum, of the variety viciae. Clovers belong to a separate cross-inoculation group, infected by Rhizobium leguminosarum, of the variety trifolii. Normally clover does not form root nodules if exposed to the viciae strain of the bacterium.

The researchers first inserted the lectin gene into a common species of bacterium found in the soil, called Agrobacterium rhizogenes. Genetic engineers use this species to shuttle the gene they are studying into plants, because it causes a condition called hairy-root disease. Cells in the diseased roots have the bacterial DNA inserted into their own genetic material.

After wounding the clover root and introducing the genetically engineered bacteria, the researchers cut off the root just below the wound. The new rootlets which grew from the cut surface, they showed, did indeed contain the gene for pea lectin.

When exposed to the viciae strain of bacteria, these new roots developed nodules, something that they would not normally do. However, the nodules were slow to form and most were abnormal. The researchers conclude that their results provide the first example of a genetically engineered host plant that has overcome the specificity of the interaction between the plant and the bacterium. But there is little doubt that lectin binding is just one step forward in a long process, involving multiple interactions between the bacterium and its host. (*Nature Vol.* 338, p. 579).

SALMONELLA'S DEFENCE LINKED TO ONE GENE

A single gene may enable bacteria to elude their host's defences, and so cause disease. Salmonella typhimuriun is a bacterium that can cause food poisoning in humans and a disease in mice akin to human typhoid. It escapes by immediate attack because it is immune to macrophages, the cells that normally engulf and kill microorganisms as they invade the host.

Patricia Fields and her colleagues at the Scripps Clinic & Research Foundation (La Jolla, California), isolated three mutant strains of S. typhimurium. These bacteria, unlike the normal strain, could not survive inside mouse macrophages. An extract from rabbit microphages killed these mutant bacteria quickly. The most effective ingredients in the extract were several small bacteria with NP-1, one of these proteins. This is a defensin, a small peptide found in macrophages, that can kill bacteria in the laboratory. NP-1 killed the mutant bacteria, whereas the normal strain survived. The mutants were sensitive specially to defensins, but not to other compounds produced by macrophages.

The researchers analysed the DNA of the mutant strains and found that all of them had a mutation in a gene called phoP. This gene is involved in making an enzyme phosphatase. When the

:opies of normal phoP to the mutants, hey behaved like normal S. typhimurum causing disease.

Other mutant strains that lack the :nzyme are not, however, killed by lefensins. So sensitivity to defensins is)robably not the result of a deficiency)f that enzyme. The researchers believe hat phoP regulates other genes, includng the gene that directly produces)hosphatase and genes that control bacerial virulence.

PhoP is the first gene that scientists iave found in Salmonella organisms hat controls resistance to the host's lefences. The mutant strains may help :ientists to work out how normally lefensins work. (*New Sci.*, 4/7/89).

TWO RIGID POLYMER SUPPORTS FOR SOLID-PHASE PEPTIDE SYNTHESIS

National Starch & Chemical Corpoation is introducing 'Polyhipe' P and AM, two rigid supports, for solid-phase)eptide synthesis. The products are ow-swelling, non compressible cellular caffolds formed from synthetic polymrs and made by a patented emulsion)rocess.

'Polyhipe' P contains a polyamide gel hemically grafted to the scaffold and laims high-capacity flow and filtration ates. 'Polyhipe' AM contains no gel,)ut the internal surface of the scaffold s derivatized with reactive sites for pepide synthesis. Both peptides contain 20)r more amino acids.

Both products are derived from the ompany's 'Polyhipe' polymer technol)gy. Structures made from this process laim high porosity, in excess of 90%)y volume.

The firm considers such porosity, long with the products' uniform and ompletely inter-connected cellular natrix structure, its chief advantages)ver competing microporous materials.

The firm also reports that these products are being developed for other biotech applications, including cell and enzyme immobilization and biochemical separations. (*CMR*, 5/29/89,p.22).

US BIOTECHNOLOGY FACING FOREIGN COMPETITION

Sales of biotech products in USA now estimated at $ 600 million annually, are projected to rise to between $ 25 and $ 30 billion in the year 2000 A.D., according to the Industrial Biotechnology Association of USA.

The US leads in all areas of biotechnology — diagnostics, medicine, forensics and agriculture — but companies in Western Europe and Japan are making inroads, aided by Government financing and looser regulations. US agencies such as the National Institute of Health and the National Science Foundation have tried to counter this competition with grants, but not everyone sees this as an answer.

So far American firms have not taken advantage of the less stringent regulations abroad and set up shop in Europe, in part because the EEC is now studying whether to establish uniform rules that, if enacted, would probably reflect the strict laws of Denmark and W.Germany. (*Chem Engg. Prog.*, 3/1989, p. 9).

THE UK BIOTECHNOLOGY HANDBOOK '88

The Association for the Advancement of British Biotechnology (A A BB) and BioCommerce Data (BCD) have recently announced the publication of a new 615 page reference book, the UK Biotechnology Handbook '88.

The handbook contains a comprehensive directory of British Organisations and also includes review articles by leading experts on key factors affecting commercial success of biotechnology such as Government grants, equipment supply, patenting, venture capital and information resources.

Handbook entries include both companies and academic bodies, and contain addresses, telephone, telex and fax numbers, up to ten senior contacts and lengthy profiles of interests, indexed under over 40 subject categories.

Published for the first time in September 1988, the handbook is an exceptionally up-to-date directory derived from Bio-Commerce Data's continously revised international online database. The UK Biotechnology Handbook is priced at $ 150 plus $ 30 for airmail postage outside Europe.

The BioCommerce Data base will become publically available in 1989 as a supplement to the well known Abstracts in BioCommerce (ABC) resource, a monitor of business news available through Dialog and Data Star. (*Further Details from BioCommerce Data Ltd.) (Old Crown Bldg., Windsor Road, Slough, UK.).*

RESEARCH ON LIGNIN-DEGRADING ENZYME RECORDS GOOD PROGRESS

Efforts to harness for practical purposes the lignin degrading enzymes (lignases) of the white rot fungus Phanerochaete Chrysosporium have been brought somewhat closer to reality by research at Oregon Graduate Centre (OGC) USA.

Researchers at OGC, have made major contributions towards understanding the biodegradation of lignin, which is the second most abundant natural polymer. Lignin is a random phenylpropanoid matrix that makes up to 20-30% of woody plants and retards microbial depolymerisation of cellulose.

Two extra-cellular enzymes produced by P.chrysosporium, lignin peroxidase and pranganes peroxidase, are responsible for the breakdown of lignin. Lignin peroxidase (LiP) was discovered inde-

pendently in 1983 at OGC and in the laboratory of T. Kent Kirk at the US Forest Products Laboratory, at Madison, Wisconsin.

Researchers Margaret Alie, Janet R. Kornegay and David Pribnow and Michael Gold of OGC have developed the first DNA transformation system for P. chrysosporium. The system represents an important step forward towards the production of large amounts of lignases. It will also facilitate studies on the regulation and expression of the genes that encode LiP and MnP as well as genetic approaches to structure function studies of the enzymes.

Additionally, the above researchers have characterized for the first time a cDNA (that is, a deoxyribonucleic acid copy of a messenger ribonucleic acid) that encodes MnP (manganese peroxidase). Combined with the P. chrysosporium transformation system, as well as research by other groups Gold reports, the results of the research on the MnP gene should allow the Oregon Graduate Centre Scientists to produce large amounts of recombinant LiP and MnP in the near future.

LiP and MnP, or modified organisms that produce these enzymes themselves could find use in a number of bioprocessing applications. There are a number of points in the production of paper, for example, where the enzyme's might be used in place of traditional chemistry. Also, numerous possibilities exist for the use of these enzymes as non-specific oxidative reagents for degrading automatic environmental pollutants such as chlorophenols and dyes. (*C & EN.*, 3/27/89, p. 29). (*Appl. & Environ Microbiol* 55, 406, 1989).

A STUDY TO HARNESS BIOTECHNOLOGY AGAINST OPEC

A new study of biotechnology in Europe, reports fermentation may be the cheaper route to producing important organic chemicals within a dozen years or so,— and this applies to a market that already exceeds $ 850 million annually.

The 230 page analysis from Frost & Sullivan reports that it is possible before the end of the century for the cost of production of fermentation based industrial ethanol to be less than the cost of production of chemically synthesized industrial ethanol in Western Europe.

Industrial ethanol is widely used in the chemical industry, commonly as a solvent and a change in the cost structure of producing it using microorganisms and biological feedstock will encourage the development of biologically produced butanol and acetone.

Research at Frost & Sullivan shows that at present using the sugar as feedstock, it cost $ 606.7 per ton to make ethanol using fermentation versus $ 543.4 synthetically using ethylene as a feedstock.

But if consumers are to use biologically produced ethanol in significant volume, the gap of $ 63.3 per ton must be closed, something that could start from a variety of factors.

The cost of ethylene has been well above the feedstock price used in the study's economic model (even a few years ago) and could rise again. This would give an advantage to biological feedstocks.

The biological feedstocks could come down in price — from actions such as agricultural subsidies from European Governments (special interest groups in France are trying to pass such a measure).

Technology costs for biotechnology will be dropping as the science advances making the actual process itself more competitive with the older established chemical technologies. (*'Biotechnology & The West European Chemical Industry'*, obtainable from Frost & Sullivan Ltd., 4, Grosvenor Gardens, London, UK. Price $ 2850).

CELLTECH AND OTSUKA COLLABORATION

Otsuka Pharmaceutical Co. Ltd. (Japan) are to collaborate with Celltech on the development of a production process for making one of Otsuka's biopharmaceutical compounds.

The agreement is for an initial collaboration to develop a biological production method so that the compound can be evaluated in Otsuka's research laboratories. (*Pro Bio Tech* (Supplement to Process Biotechnology), 4/1988, p. ii).

SINGLE CELL OIL

The biotechnological exploitation of microbes for the production of various lipids has obvious potential and some proven successes, notably in the steriod field.

A recent publication from Longman Scientific & Technical, Harlow, UK should be of interest to researchers in this field.

The publication titled 'Single Cell Oil' is invitingly short and assesses the prospects for the bulk production of edible oils and fats (meaning triglycerols) and at the same time explores the scientific basis of oleagenicity on microorganisms.

The subject matter is presented by a small team of seven, all actively involved with this budding technology. The opening chapter of the text by R.S. Moreton rightly sets the scene by first explaining the concept of single cell oil, and then reviewing the traditional market in oils and fats (sources productive levels, trends, prices, compositions, applications).

Moreton's chapter goes on to illustrate the potential of oleagenous yeasts through a consideration of the major factors (e.g. carbon nitrogen ratio in the

medium, sources of these elements, growth rate), which influence lipid accumulation and composition.

The second chapter by one of the pioneers of microbial lipidology (C Rutledge) takes the story further by dealing with 'Biochemistry, stoichiometry, substrates and economics'.

The biochemical basis of oleagenicity is apparently the efficient production of acetyl-CoA by certain microorganisms possesssing ATP citrate lyase.

The metabolic pathways culminating in the bio-synthesis of the major classes of fatty acids and the triglycerols are outlined and appraised from the standpoint of oleagenicity.

The chapter goes on to consider the suitability of complex substrates and a possible economic scenario.

The text covers some algae with a future in lipid biotechnology. The fourth chapter by R.J. Davies is an instructive case study of a process for the production of a possible substitute for palm oil from cheese whey by the yeast Apotrichum curratum.

The process is described in detail and in the particular geographical context (New Zealand) seems to approach commercial viability.

The final chapter (F.G. Hammond and B.A. Glatz) discusses the twin problems of lipid extraction and analysis. The treatment is necessarily brief. The text is authoritative and fairly well up-to-date.

Therefore, it should educate and inform scientists and technologists on the fringe of the subject of great interest to India suffering from perennial shortage of edible oils. (*Single Cell Oil*, Edited by R.S. Moreton, Longman Scientific & Technical, Hurlow, UK. pp. 165. Price £ 19.00)

Science Briefs

GRG — A LOW-COST SUBSTITUTE FOR WOOD

The Central Glass and Ceramic Research Institute (CGCRI), Calcutta, has developed glass reinforced gypsum (GRG), a low-cost composite material which may be used as a substitute for wood.

The material would be particularly suitable for cheap housing schemes. Its large-scale use would also lead to conservation of forest resources and thus help in halting further denudation which is a serious threat to the environment.

The material is made by uniform spraying of gypsum (in the form of a slurry) and chopped glass fibre on a flat-bottomed mould of suitable dimensions. The sprayed mass is allowed to remain there till it sets to form a solid board. It is then demoulded, dried and trimmed to requisite sizes.

GRG possesses the basic characteristics of timber and can therefore be used for constructional and household purposes. It can be sawed, drilled, nailed and screwed with conventional tools. It can be polished to look like fine-grained teak wood and painted to give a glossy metal-like finish.

Besides, it has many advantages. It is fire-proof, insect-proof, rot-proof and offers better dimensional stability during seasonal changes: factors which ensure long service life in indoor applications. Further it can be made to the required size and thickness to meet the customer's needs, thereby reducing labour, wastage and joining cost.

Although gypsum is softer and much more brittle than cement, GRG is tougher than cement-asbestos boards and possesses adequate tensile and transverse strength. Because of its extra toughness, it may also replace cement asbestos boards in indoor applications, and does not pose any health hazards. Unlike wood, it has equal strength in all directions and can therefore be used for making large-sized boards similar to plywood and particle boards. Further, GRG boards do not suffer from delamination and debonding, common to timber-based boards.

GRG boards costs less than half of what teak wood boards do and are almost at par with other varieties of timber used for furniture making and constructional purposes. They are a little costlier than plywood and particle boards. However, this is compensated by their better appearance and longer service life. The cost may be further reduced by using 'phospho-gypsum', an industrial waste available in plenty, in place of gypsum and cheaper 'n-glass' fibre developed at the institute.

The material has good potential for export to the neighbouring countries, where scarcity of wood is a common problem.

-- PTI Science Service

BREAKTHROUGH IN JOJOBA TISSUE CULTURE

Scientists at Lucknow achieved a significant breakthrough in the tissue culture of jojoba, an important source of liquid wax, when they successfully transferred test tube-raised plantlets of jojoba to soil. The group of scientists led by Dr. H.C. Chaturvedi, a biotechnologist at the National Botanical Research Institute (NBRI), Lucknow, have transferred in-vitro jojoba plants to soil where they are growing vigorously. While scientists the world over have attempted to propagate the dioecious plant through tissue culture, there was not much success in transferring the in vitro plantlets to soil, Dr. Chaturvedi said.

His group has now standardised a method for in vitro proliferation of the auxiliary buds of jojoba, botanically known as Simmondsia chinensis. The scientists induced an auxillary bud from the nodal segments of a male or female plant to proliferate in a medium supplemented with plant growth hormones. On further subculturing the shoots raised in vitro, new shoot buds continued to form, said Dr. Chaturvedi who reported his findings in the international journal "Plant Sciences." On an average, five to eight shoots were formed per explant in the initial cultures, but their number increased to 15 in subsequent cultures.

The isolated shoots were allowed to root in a special medium, and the in vitro raised plants were further exposed to varied humidity conditions to help them adapt better after transplantation in soil. "Such tissue cultures therefore constitute a tissue bank for obtaining cloned planting material of known sexuality of jojoba over the years,--a practical means of germplasm preservation, "Dr. Chaturvedi said.

Seeds of jojoba produce liquid wax, a substitute for sperm whale oil with immense commercial value as a high-pressure lubricant. The carnauba wax is used in cosmetic, tanning and leather industries. The plant is also the source of some petroleum and pharmacological products.

-- PTI Science Service

DRY CHEMISTRY EXPLOITS DOMESTIC MICROWAVES

French chemists have devised a "dry" method of carrying out reactions using a microwave oven. The method, which uses solids rather than solvents, is safer than previous methods and makes use of a cheap domestic oven, reports "New Scientist". Previously, microwave chemistry has needed purpose-built oven which are up to 30 times the price of the domestic variety.

The chemists, Andre Loupy, George Bram and Mustapha Majdoub of the University of Paris-Sud, absorbed their chemicals on inert inorganic solids, such as silica, alumina or montmornonite clay. They found that chemical reactions proceed faster with the dry method.

The French chemists have made octyl acetate with a yield of 80% in just 10 minutes by heating potassium acetate and bromo-octane absorbed on silica. When they used alumina, the yield of the product went up to 90%. If they had used a conventional heater, it would have taken five hours at 100 degrees Celsius to achieve a comparable yield.

In another reaction, the chemists cut the reaction time by a factor of 200. The reaction is one in which pinacol, a double alcohol, eliminates water to form a ketone on heating. Loupy absorbed the pinacol on a clay, monmorillonite, which is a silicate mineral. Metal ions, contained in the clay, also affected the reaction. When the metal ions were calcium, the yield was 23 per cent after 15 minutes. With chromium, the yield soared to almost 100 percent. Using a conventional electrical heater, the yield was only two per cent after 15 hours.

The French group has also found an alternative way of carrying out the ester reaction. They add a solid catalyst to the mixture of potassium acetate and bromo-octane. The catalyst they use, Aliquat, or trioctyl methyl ammonium chloride, increases both the yield and speed of the reaction. With no catalyst and give minutes of heating in a microwave oven, the yield of ester was only 1 per cent. By adding a small amount of catalyst, however, the yield jumped to 95%. Usually, it takes hours to get this kind of a result.

Loupy and his colleagues have performed their experiments in open beakers and flasks in a domestic microwave oven. This is in marked contrast to conventional microwave chemistry, in which a reaction mixture must be sealed in a Teflon plastic bottle inside a purpose-built laboratory oven. This is because using microwave ovens to heat chemicals is a risky business. Solvent vapour can fill the oven and an explosion can occur. The absence of solvents also means that the new dry method of microwave chemistry allows reactions to be done on a large scale.

-- **PTI Science Service**

NEW SOLAR CELL ABSORBS LIGHT ON BOTH SIDES

West German scientists have developed a new kind of solar cell which absorbs light on both sides and transforms it into electrical power with unprecedented efficiency. The most obvious difference between the new solar cell and its precursors is the finely crafted pattern of metal bridged on the new cells' backs. This feature is responsible for one of the advantages the new cells have over the old ones; the solid back in older cells can now be replaced by the grid so that the cell can absorb light not only on one but on both sides and transform it to electrical power.

According to Dr. Rudolf Hezel of the Institute of Materials Science at the University Erlangen-Nurnberg, the new solar cell can be manufactured at a low cost, lasts longer, weighs less, and is flexible. Due to its open back, it leads to unprecedented efficiency rates. While traditional cells transform less than 15% of the incident light into electrical energy, the new type of cells has already achieved efficiency rates ranging between 20 and 24%. Experts believe that the performance can be improved even further, because of its double-face design which will help it to process both incident and reflected light. This means that direct sunlight can easily be diverted to the back side.

The cell also efficiently uses "diffused light" present in overcast weather and occuring most frequently in median latitudes. The layer of crystalline silicon that transforms light to electrical energy is no thicker than a human hair and carries an insulating silicon nitride coating.

This design reduces the cost of materials by 50%. The silicon nitride layers also protects the cells from humidity, thus increasing longevity. The aerospace company Messerchmitt-Bolkow-Blohm (MBB) in Munich plans to test the applicability of this new light-weight development in outer space. Dr. Hezel, however, is planning primarily to apply the new solar cells in the most sunny regions of the globe, arguing that large scale application would be most profitable there.

-- **PTI Science Service**

DIRECT VIEWING OF A SUPER CONDUCTOR IN ACTION

Researchers in Japan have developed a technique which gives them a direct view of magnetic lines of force passing through a superconductor. The technique enables researchers to see individual units of the magnetic lines of flux, known as fluxoid quanta, passing in and out of the superconductor, reports New Scientist.

The team, working for Hitachi, produced the image by making hologram of a thin film of super-conductor which they bathed in beams of electrons. The apparatus, in which liquid helium cools a thin film of metallic superconductor to 2.5 kelvin, has a resolution of 2 namometers. The image, Hitachi says, is a direct image of individual fluxoid quanta as they enter the thin film.

The researchers say a reliable way of observing fluxoid quanta directly may lead to better understanding of the way magnetic fields behave around superconductors. In turn, this may lead to the development of superconducting material capable of handling larger current-- an important limit on today's superconductors.

-- **PTI Science Service**

THE SEARCH FOR MAMMOTH GENETIC MATERIAL

What is believed to be the first ever attempt to obtain genetic material from mammoth remains is to be made at Bristol University in south-west England.

Third-year student Mr. Charles Cockell from the University's biochemistry department is studying a piece of mammoth tissue 40,000 years old in the hope of discovering genetic material--known as deoxyribonucleic acid or DNA--that will enable him to compare it with similar material from the elephant. In this way it is hoped eventually to establish when the two species diverged.

The mammoth tissue was given to Mr. Cockell by the Leningrad Zoological Institute. The mammoth from which it was taken was discovered by a Soviet scientific expedition in 1908 on the Magadan Peninsula, Northern Siberia. The area is well-known for the larger of preserved mammoths that have been found there, particularly at the turn of the century.

The tissue will be ground into small fragments and subjected to a process known as phenol extraction, which allows the genetic material to be separated out. To identify the latter, ultra violet light is directed onto the solution and, depending on the amount of reflected light, there is a distinguishable signal from the genetic material which allows positive identification. The DNA is then placed in a solution containing bacteria and other genetic material which convinces the bacteria that the DNA is their own. As the bacteria increase and divide, the mammoth DNA should also increase.

STAINLESS STEEL COATING SPRAY

A Bombay-based manufacturer has come out with a stainless steel coating technology using a novel method —stainless steel coating spray in aerosol cans — which creates an armour of corrosion-resistant layer. The spray combines a quality binder with high leafing stainless steel flakes to create a rustproof coating. When applied the stainless steel flakes rise to the surface of the coating, forming a satin smooth layer of tough durable metal while the binder protects the object underneath.

The coating provides maximum resitance to corrosion caused by weather, ultraviolet light, abrasion and harsh environment. It is also stable in high temperatures and lasts for years. It seals out moisture, is lead-free, offers excellent salt spray resistance and requires no additional paint or sealer. It can also withstand temperatures upto 815 degrees Celsius. while offering excellent flexibility and wearability.

The spray can be used on all metals. wood, plastics, almost on any surface. The areas of use are dairy equipment, paper mills, mining, chemical processing, oil field drilling kits, hot steam valves, water meters, boilers, engine blocks and exhausts, stoves heat ducts, oven doors, municipal sewage equipment, boats and marine equipment, meat, poultry, food and beverage plant equipment, nuts and bolts and all metal work for wear and rust proofing. Before using, clean all surfaces thoroughly of contaminants or rust. Shake the container well for a few minutes, and spray in a sweeping motion no closer than 25 to 30 cms across the work area. Several thin coats are better than one heavy coat.

-- PTI Science Service

NON-POLLUTANT EXTRACTION OF GOLD BY BACTERIA

Gone are those pioneering days of shaggy gold diggers examining closely the glitter of a nugget in their sieve. In France now it's the turn of bacteria to extract the precious metal, from puddled metallic sulphides in four experimental

reactors, reports CEDUST. Such is the solution provided by the French office of Geological and Mining Research (BRGM) to the depletion of reserves and the low gold-content in new deposits. Instead of burning the sulphides in furnaces, which is a very polluting technique as it releases arsenic, these bacteria work very cleanly, by oxidation, and extract 3 grams of gold from 100 kilos of sulphide per day. That is two times more than through the conventional extractions method.

"It could thus be possible to double the production of a French mine which usually produces 2.2 tonnes", says Mr. Pierre Ollivier, one of the officials in charge of the implementation of this process. This would also make viable the opening of five new mines in France.

-- PTI Science Service

UK PROCESS BREAKTHROUGH FOR SUPER-CONDUCTORS

Researchers at GEC's Hirst Research Centre at Wembley in the United Kingdom have developed a low-temperature one-step process for producing ceramic superconductors which is claimed to give the company a lead over the US and Japanese competition. The films made by the process lose all electrical resistance at 82 K, reports the journal "Engineering".

The process involves depositing thin films of the material from a patented bismuth-strontium-calcium-copper-oxide target using a magnetron sputtering technique. This allows the superconducting phase to be produced at a temperature of 630 degrees Celsius, compared to more than 800 degrees Celsius for competing techniques. The films are fabricated in a simple one-step process whereas other techniques involve a second processing step, called post deposit annealing, to achieve superconducting transition temperatures above the boiling point of liquid nitrogen (77K). Another advantage of the GEC process is the smoothness of the resulting thin films.

Dieter Jedamzik, the scientist responsible for the process, is currently working on the fabrication of thin films of another phase of the same material which will give an even higher superconductivity transition temperature.

-- PTI Science Service

ELECTROSTATIC FILTER/-COOLING SYSTEM FOR FLUE GAS

TNO researchers have developed a plastic electrostatic system for the cooling and cleaning of flue gas. This system not only ensures that a high level of a boiler efficiency is achieved, but also removes environmentally harmful substance such as sulphur trioxide ar nitrogen dioxide and flyash from th flue gas. Until recently, the removal o fly ash in particular was a very diffi cult problem.

Flue gases from coal combustion pro cesses and drying processes usuall leave the chimney at a temperature o around 120 degrees C. At this point the flue gases still contain environment ally harmful condensable substance such as sulphur trioxide and nitrogen dioxide and flyash. A flue gas cooler or condenser can improve boiler efficiency and remove acid-forming components from the flue gas if the condenser is operated at a temperature below the acid dew point, sulphur trioxide and nitrogen dioxide are removed from the flue gases by condensation. In this case, corrosive condensates (sulphuric acid, nitric acid) are created and plastic must be used to coat or replace metal parts.

Existing flue gas coolers remove little or no dust (flyash). In order to prevent flyash from escaping into the atmosphere, a separate standard dust filter must therefore be used, such as a bag filter or an electrostatic precipitator, a fairly cumbersome and expensive procedure.

In a joint project by the Centre and Polymeric Materials and the Division of

Technology for Society, TNO researchers have succeeded in developing a combined filter-cum-cooler/condenser. The system produces high boiler efficiency, removes harmful condensable substances such as sulphur trioxide and nitrogen dioxide from flue gases, and has surprisingly high dust collection efficiency.

The flue gas flows around a collection of parallel corrosion-resistant pipe (heat exchange elements) in the cooler so that the gas flow is perpendicular to the cylinder axis. The pipes can be poisitioned either horizontally or vertically. Air or water (the fluid) flows through these pipes to draw heat from the flue gas. When the pipes are positioned horizontally, the condensate drips from the pipes and when they are placed vertically, it flows downwards along the pipes.

In principle, the pipes are made from a plastic which, in both its mechanical and chemical properties, is sufficiently resistant to a flue gas temperature of 120 degree celsius. For higher temperatures, ceramic material or glass could be used instead of plastic. The high level of dust-collection efficiency in the equipment is due to the application of an inhomogeneous electrostatic field. The pipe walls contain a conductive component so that high electrical voltage can be applied. The electrostatic field is created by maintaining the pipes alternately at positive and negative potentials. This causes electrically-charged dust particles to be deposited on the pipes.

In order to increase dust collection even further, the heat exchanger is connected to a Corona charger, a device for the electrical charging of the dust particles in the flue gas. When the dust particles are negatively charged, the dust is deposited on the pipes with the positive high voltage. In this way, half the pipes function as collectors, whereas all pipes are involved in heat exchange. Half the pipes remain more or less free of dust so that heat exchange is not hindered.

A system with dimensions in width, height and length of 1 x 1 x 2.4 m^3, equipped with 3050 pipes with a diameter of 0.02 m, has a heat exchanging surface of approximately 200 m^2 and a collector surface of 100 m^2. On the basis of calculations and measurements, the TNO researchers have concluded that at a flue gas flow of 2 m^3/s such a filter/cooling system will cool the flue gas from 120°C down to 60°C. For particles of 0.1-10 dust collection efficiency will be higher than 99.9%. The evidence is that the collection efficiency increases with the voltage difference on the pipes and with the diameter of the particles. The most important applications for the newly developed system include the cleaning of flue gas from coal combustion plant (both small-scale and large-scale) and the cleaning of gases in drying processes.

SOVIETS DEVELOP NEW METHOD TO IMPROVE PETROLEUM QUALITY

Soviet scientists have developed a new radiation biotechnology to improve the quality of petroleum, lessen oil equipment corrosion and increase the service time without polluting the environment, reports APN.

Currently to increase oil production, water is pumped into the oil bearing layer which, however, contains many harmful microorganisms. The sulphate-restoring bacteria present in water not only spoils oil quality but also corrodes oil ducts, causing frequent ruptures and oil spillages. Attempts are being made world over to develop different technologies to remove the microorganisms from water. But they cost much, require many stages and do not guarantee complete suppression of bacteria. Soviet scientists of the academian Ivan Gubkin Institute of Oil and Gas have developed a technique to process water which "kills" harmful microorganisms. It is based on irradiating the water pumped into the oil bearing layer. In the process water does not become radioactive and is rendered "harmless".

New Products

SEQUEST CHELATING AGENTS

Sequest brand of chelating agents are claimed to be highly powerful new generation metal binding agents useful in various applications such as textile processing soaps and detergents formulations, industrial water treatment, leather processing, electroplating, corrosion inhibition and scale removal and as additives for rubber, plastics, paints etc. The manufacturers M/s. Enzymes, Pharmaceuticals & Industrial Chemicals Pvt Ltd. claims that in textile processing SEQUEST controls water hardness, stabilises peroxide against oxygen loss, control heavy metals, improves fabric quality and reduces bleaching cost. Various grades of SEQUEST are available as white free flowing solids which are easily soluble in water, or as aqueous solutions. They are thermally and hydrolytically stable, environmentally safe and non-toxic. Their sequestering value (mg. $CaCO_3$ sequestered per gm. of product) vary from 100 to 750 thus making them two to four fold more effective than conventional sequestering agents such as ethylene diamine tetra acetic acid (EDTA), NTA and polyphosphate SEQUEST is highly cost effective and can be used in place of conventional chelating agents without process modification. Further information can be had from Enzymes, Pharmaceuticals & Industrial Chemicals Pvt. Ltd., 206, Raikar Bhavan, Sector No. 7, Vashi, New Bombay-400 705.

HEAT TRANSFER EQUIPMENT

Micro Finish Engg. Co., specialise in the design and manufacture of heat and mass transfer equipments. The product range includes heat exchangers, after coolers, oil coolers and fin tubes heaters, coolers and their modified versions like, "U" bundle type, floating head type, and bayonet type from M.S., S.S., copper and brass as per TEMA CLASS "C" and IS 4503, and other standard pressure vessels, reaction vessels, lead bonded vessel and air-receivers are made to IS 2825, ASME Sec. 8, Div. I and customers specification. The products made for us in airconditioning and refrigeration industries include condensors, Dx. chillers, and air handling units from copper tubes for freon application and shell and tube type condensors, chillers, and receivers for ammonia application covering the range from 5 to 200 TR. The company offers direct inspection with guarantee or can arrange inspection by third party.

For further information please write to Micro Finish Engineering Company, Plot No. 3005, Phase IV, GIDC, Vatva, Ahmedabad-382 445. Gujarat. (Phone: (F) 830616).

MORE EFFICIENT BOILER DEVELOPED IN SWEDEN

An engineer based in Stockholm has invented a boiler which, he claims, consumes half the wood of conventional boilers and wastes less heat. The boiler is efficient because it burns its fuel in two stages, and so burns it more completely and cleanly, reports "New Scientist". The boiler is the result of four years' research at the Royal Institute of Technology in Stockholm and is now being made by Combi Heat, a company based in Lulea in Sweden.

Wood in ordinary boilers does not burn completely, because cold water passing through pipes around the burning wood cools the flames and leaves some of the wood unburnt. The boiler therefore uses more fuel than necessary and the unburnt wood produces smoke and ash which pollute the atmosphere.

The new boiler prevents water cooling the fire by separating the furnace from the heat exchanger. The furnace is lined with ceramic material, so it can reach much higher temperatures than conventional boilers and burn more of the wood. Wood needs oxygen from the air to burn. In conventional boilers, there is a small door below the furnace through which air enters. The new boiler increases the amount of oxygen in the furnace by blowing air into it by a fan. Not all the fuel burns at this stage. The unburnt and partially burnt fuel rises as hot gases and smoke which burn in a second combustion chamber, above the furnace. The upper chamber is conical and concentrates the hot, gaseous unburnt fuel.

The heat generated by this process reaches a heat exchanger, which in turn heats water. An electronic system measures the quantity of air that is needed for combustion, and controls the fan.

SCANNER TESTS FOR LEAD POISONING

Researchers in the US have produced a scanner that may provide a quick and painless way of determining how much lead people have in the bodies. The device, developed at the University Hospital at Stony Brook, New York, will come as good news to doctors who have been waiting for a simple and effective way of screening their patients for lead, reports "New Scientist".

Lead poisoning is one of the most serious environmental threats to children's health. Even at low concentrations, the metal may damage the brain and other organs, and health authorities in the US have recently reduced the threshold for acceptable levels of lead in the body.

A simple blood test reveals only recent exposure to lead, because the metal quickly finds its way from the bloodstream to the bone. The problem is that a number of processes will unlock minerals from the bones and free them to circulate in the body. The minerals enter the bloodstream at, for example, pregnancy, lactation, osteophorosis and the spurts of growth at adolescence.

The standard method that doctors use to measure lead levels and treat lead poisoning is to introduce a chemical called ethylene diamine tetra aceticacid (EDTA) intravenously into the body. EDTA draws lead out of the bone and binds to it. The body then excretes the compound in the urine, which clinicians analyse for lead. However, doctors cannot screen people with this test, because it is painful and requires the patient to stay in hospital for upto three days.

Now Lucian Wielopolski and colleagues at the University Hospital have developed a scanner that could provide doctors with a way of screening people for the level of the metal in the body. The scanner uses X-rays to measure the amount of lead in the bone.

Wielopolski's scanner irradiates the femur with low energy X-rays and measures the fluorescence of the lead in the bone. The greater the fluorescence, the greater the amount of lead. Wielopolski calibrated his device by scanning bones from amputed limbs, then analysing samples of the bones to determine the levels of lead they contain. He compared the results his machine gave with the EDTA test on the same samples, and found that they give very similar results.

The low-energy X-rays used by the scanner penetrate only a few millimeters of tissue, so the test works only on bones or organs which are close to the skin, such as the femur. Wielopolski and his colleagues have set up a company to sell their scanner, but they feel they still need to improve their machine before it can be used for routine testing. Each scan takes more than 16 minutes, which is a long time for anyone, especially a child, to be strapped on to a scanner. Weilopolski hopes to bring the time down to five minutes or less.

The scanner can detect almost any element present in the skin or bone. Weilopolski has used it to determine levels of several elements, including strontium, copper, zinc, iron and bromine. He has also used the scanner to measure the levels of iron in the hands of patients with thalassaemia, an inherited blood disorder.

ON-LINE ANALYSER FOR CYANIDE

A field-programmable, wet chemical analyser for on-line monitoring of cyanide has been developed by an American company Tytronics Inc. The model FPA 354 analyser can reportedly carry out reliable unattended measurements of CN concentration in mineral processing streams including tailings with the frequency and accuracy demanded by environmental regulations.

The FPA 354 is said to duplicate the standard laboratory procedure for CN determinations by volumetrically capturing a sample and titrating with silver nitrate solution. It does, however, replace the lab methods of grab sampling, thus reducing human contact with the cyanide solutions.

Offering an availability said to exceed 95 per cent the analyser requires minimal operator training and can be serviced rapidly and simply by virtue of its modular design of valves, pumps and electrics coupled with menu-driven softwares. It has a patented flow-through reaction cell and only one moving part in the sampling system. The unit also carries out self-calibration automatically at programmed intervals.

The duplication of standard lab analysis is allegedly with a precision of 2 per cent on line, and both free and total CN concentrations ranging from ppm to percentages can be monitored by altering the titration procedure slightly. The instrument can be used to monitor both aqueous and non-aqueous streams.

MOBILE COAL WASHING PLANT

A compact, mobile coal washing plant which reportedly offers the small mine operator the benefits of technology previously available only in large, fixed coal prep plants has recently been introduced by the U.K. company Birtley Engineering.

Designated the Birtley 'Bulldog', the plant is said to achieve greater than 90 per cent coal recovery, says a report in the "Mining Magazine". Tractor-mounted, the Bulldog can serve a number of small separate mines, given that a suitable standing area, power supply, water and drainage are available at each site. A number of small operators could thus share ownership of one mobile plant.

With a capacity of 60 t/h raw coal, the Bulldog employs a low-loss, closed magnetite heavy media circuit operating within the r.d. range 1.3-1.9. Constructed on a standard road-going lw loader, it is equipped with an inclined wheel separator, tanks and pumps — the type of equipment found usually in large, fixed plants, the report said.

Birtley claims that in certain circumstances the bulldog could pay for itself within 6 months. The plant is also felt to be of considerable interest to coal producers outside the UK. Further details are obtainable from Birtley Engineering, which recently became the newest subsidiary of the Taylor Woodrow Group.

EXPLOSIVE "CRIMPING" SOLVES GAS BLOW-OUT DANGER

Scientists believe the problem of dangerous gas blow-outs on production rigs can be solved by a new explosive pipe closing device. British Petroleum (BP) is working on such a device at its research centre at Sunbury, near London, and says it has a number of advantages over barrier valves and other safety devices.

The idea of using explosives to

"crimp" shut a sub-sea gas line or riser is one of a number being considered by BP in the light of the recent Piper Alpha rig tragedy in the North Sea when large quantities of gas escaped and ignited to wreck the platform.

The BP Explosives Working Group initially began work on a method to simplify the removal of "dead" platform legs and to facilitate the movement and relocation of sub-sea pipes. "We realised early on in the research that the method could be suitable as a barrier valve device to block gas risers in an emergency," said Mr. Roy Johnson, senior scientist of the mechanical engineering and instrumentation branch at Sunbury.

Use of explosives is barred at the research centre so all practical work has been carried out at sites available to the U.K. Royal Military College of Science. "We started on a 50.8 mm pipe and over 30 tests were carried out before we narrowed it down to three methods", continued Mr. Johnson.

"These were then progressed and scaled up to a 305 mm actual North Sea pipeline section. Initially the experiments were carried out in air at a Ministry of Defence range. Then submerged tests were made and as a result, one method has now been selected and final stages of development are proceeding."

The method chose involves an hexagonal box built round the pipe containing an explosive called Ammatol which when fired crimps the pipe, virtually closing it.

It can be fitted during construction or at any time later without halting production. And it is small and has less protruberances to snag cables or fishing gear. Only limited maintenance is required and the explosive charge is very stable at sub-sea temperatures.

POLYBUTADIENE FOR TYRE

In the shape of Buna CB 22, 23 and 24 Bayer AG has developed a new type of polybutadiene for the tyre industry. These tyre rubbers, which are manufactured by Bunawerke Huls GmbH with the aid of complex catalysts containing neodymium, are distinguished by decisive advantages in processing and application.

A special combination of structural parameters — a low degree of branching in conjunction with a relatively broad molecular weight distribution —has led to a considerable improvement in the behaviour of compounds.

The more viscous grades of Nd-Br, Buna CB 22 and 23, are particularly suitable for blends with natural rubber. Buna CB 24, whose viscosity is lower, is used mainly in blends with styrene-butadiene rubber.

For further details write to Jagat Chemicals Private Ltd., 17th Floor, Express Towers, Nariman Point, Bombay-400 021.

CLEANER

Three-in-one, Chlodet liquid, a balanced combination of active chlorine plus wetting and penetrating agents, is specially designed for achieving the required high standard of hygiene and cleanliness in dairy, hospital, pharmaceutical, food processing industries very economically.

Because of its unique ability to penetrate even the organic soil and kill micro-organisms, the action of chlodet is uniform. It destroys all types of micro-organisms, including those which are not affected by other disinfectants.

The broad spectrum of chlodet action includes bacteria, bacterial spores, viruses, algae, fungi, moulds, yeast, etc. It also reacts with the putrid organic waste matters and destroys the foul odour effectively.

For further details contact Corona Corporation, 3, Nilkanth Sadan, Per Bagh, Aarey Road, Bombay-400 063.

Human Gene Therapy — The Last Frontier

As doctors continue to battle against recalcitrant diseases that defy treatment, they are preparing for an attack on the final frontier — the genes that are the site of the defect.

Their approach, based on the concept of gene therapy, involves replacing or correcting the defective genes, or supplementing them with normal, functional ones, to correct certain serious disorders of the bone marrow, liver, blood, hormones, enzymes and the central nervous system. The assumption behind this approach is that the genetically-altered cells will proliferate and overwhelm their defective kin.

The concept gained world-wide attention in 1980, when Martin Cline, a specialist in blood disorders from the University of California, Los Angeles, first tried to cure two thalassemic patients by introducing normal haemoglobin genes into their bone marrow, the site of production of red blood cells. The experiments failed, and Kline was severely criticised for his unconventional approach. But once the furore died down, researchers began to realise the inherent potential of this technique.

Gene therapy essentially involves the stable and heritable introduction of normal genes to correct disorders. It attempts to strike at the root cause of the disease, rather than the effects which present themselves as symptoms.

Although there have been no further experiments in humans, scientists have conducted several tests in animals, and reported encouraging results. Recent progress in the field has led scientists to propose three strategies of operation gene replacement, gene correction or gene augmentation.

Gene correction involves the removal of a specific mutant gene sequence from the genome and its replacement with a normal, functional gene. Gene correction would entail specific correction of a mutant gene sequence without any additional changes in the target genome. The third strategy, gene augmentation, deals with modifying the expression of mutant genes in defective cells by introducing foreign, normal gene sequences.

Gene correction has gained some ground in recent years with several groups abroad reporting that genetic modification of a known gene sequence is theoretically possible. Researchers have found that cells contain enzymatic and structural machinery that enable foreign, targetted sequences to produce mutations at specific sites in the host genome.

Gene augumentation is, perhaps, the most established of the three techniques. In many cases, it is possible to restore genetic function by adding non-targetted but functional gene sequences into non-specific sites of the genome without correcting the defective gene, according to a report by Theodore Friedmann, from the University of California, San Diego in the journal "Science".

However, the development of gene therapy is strewn with obstacles. The technique is applicable only to tissues that grow and divide continously, such as the bone marrow, skin and intestinal cells and not to genetic diseases that affect non-proliferating tissues like the central nervous system. The technique also does not offer any solution to mutagenic disorders or abnormalities caused by entire chromosomes.

Progress in gene therapy is encountering three major problems - efficient gene transfer, ensuring proper functioning of the new gene and its non-interference with any other normal processes of the cell.

Scientists are reporting encouraging results with respect to the first problem, although the next two are proving more difficult to tackle. A number of physical and chemical methods are now available for the transfer of funtional DNA sequences into mammalian cells. These include co-precipitation using calcium phosphate, use of lipids or polycations to complex with DNA, exposure of cells to rapid pulses of high voltage (called electroporation), direct microinjection using a hollow glass needle thinner than a hair, and the use of high-velocity tungsten microprojectiles that carry the DNA.

However, the most promising method of gene transfer appears to be through virus vectors, especially retroviruses that insert their genes into the chromosomes of human cells they naturally infect. Early work on virus vectors concentrated on tumour viruses like the papoviruses and adenoviruses, which integrate into host cell genomes and express the foreign genes stably and efficiently, without harming the host cells. But interest in them waned because of their limited capacity for foreign genes and now scientists are concentrating on retroviruses.

Retroviruses normally cause serious diseases, including cancer, but their disease-causing genes can be removed and a therapeutic gene "stitched" onto the gene that enables the virus to enter the cells. Although retrovirus vectors are capable of infecting a broad class of cell types, cell replication and DNA syntheses are required for integration of the phage genome, which restricts their use to replicating cells only. They suffer from two other disadvantages - site-specific recombination is low and they do not produce the high levels of titer needed for in vivo application.

Work on in vitro gene transfer followed by implantation of the modified vector into the recipient organism, has focussed on disorders of the bone marrow, liver and the central nervous system, cancers and even some of the

nfectious diseases like AIDS. Mammalian bone marrow has emerged as one of the most attractive organs for early studies on gene therapy as it fulfils many of the requirements: it is easily accessible, can be manipulated in vitro, is susceptible to genetic modification and can perpetuate the correction.

The earliest targets in this area were disorders of the haemoglobin molecule, including sickle cell anaemia and thalassemia. Early attempts at transferring normal haemoglobin genes into animals were not much successful as scientists could not achieve proper regulation and expression of the new gene. But, recently, hopes have renewed for thalessemia, with researchers in the United States reporting successful treatment of the disease in mice, using foreign normal gene sequences along with certain regulatory gene sequences. Similar regulatory genes have also been found in humans.

Investigators have also been successful in vitro transfer of normal genes into rat liver cells. The central nervous system is, however, not as amenable, because the target cells in this case, the nerve cells or the neurons, are not easily accessible and are non-dividing.

Another promising concept is that of in vitro gene transfer into skin cells and reintroduction of these modified cells into the donor organism (called autograft). In vitro gene transfer and autograft have been mooted for genetic therapy of haemophilias, some forms of diabetes, and other deficiencies of enzymes and gene products.

Researchers are also suggesting gene therapy for treating many cancers, in view of the latter's association with aberrant genes. The discovery of certain cancer-including genes called oncogenes and the fact that some cancers like retinoblastoma and Wilm's tumour in humans are triggered by the inactivation of a normal cancer-suppressing gene have added further impetus to the idea of genetic therapy for treating cancer.

Direct introduction of the gene vector into the target organ is a theoretically more attractive but practically less feasible alternative. Vectors such as viruses, naked plasmids or cloned genes encapsulated in liposomes or red blood cell ghosts have been used by some scientists to introduce genes, proteins, toxins and other agents directly into whole animals. There are also reports of successful expression of foreign insulin genes introduced directly into receipient rats, and of a naked plasmid that had been precipitated with calcium phosphate and then injected into rat liver.

Apart from the technical hurdles, one other basic hurdle remains - the debate over whether it is ethical to interfere with the genetic make-up of human beings. For example, while genetic engineering of embryos, involving insertion of normal genes into human embryos, can theoretically cure inherited diseases in which a number of different parts of the body are affected, in actual practice, only 10 per cent of the fertilised mouse eggs used in mice experiments, survived, and society would never tolerate this survival rate in human eggs.

-- PTI Science Service

VITAL DRUGS FROM BLUE-GREEN ALGAE

Blue-green algae, which are found floating as delicate strands on the surface of waters and beneath the soil, can be the source of vital pharmaceutical compounds, and may even play a role in the biological warfare against mosquitoes, recent research shows. "The isolation of pharmaceutical compounds from blue-green algae is one of the most exciting recent findings in biology," Dr. G.S. Venkataraman, Director of the National Facility for Blue-Green Algae said.

Scientists at the University of Hawaii recently succeeded in isolating two important medicinal compounds from blue-green algae, which are also referred to as Cyanophyta. One was the chemical cytonemin, which was derived from scytonema species, and was found to be effective against skin cancer. The second was a calcium blocker, which was obtained from tolypothrix and is generally administered during heart attacks to improve blood circulation.

The Hawaii scientists have successfully purified, analysed and characterised the two compounds and confirmed their medical benefits in laboratory experiments. The advantage of these findings is that it paved the way for large-scale industrial production of the two compounds through genetic engineering.

The genes responsible for the synthesis of the two chemicals can be transferred to a suitable microbial system that multiplies at a fast rate to produce large quantities of the pharmaceuticals. Blue-Green algae cannot be directly used for large-scale manufacture as they are "recalcitrant forms" that grow very slowly and are not amenable to modern gene manipulation techniques, he said.

The National Facility for Blue-Green Algae, housed in the large campus of the Indian Agricultural Research Institute (IARI), has an impressive collection of over 460 blue-green algae, including tolypothrix. But, a concrete plan, involving algoligists and biotechnologists and specialists in organic chemistry, needs to be formulated before scientists can undertake the venture in India, Dr. Venkataraman cautioned.

Another potentially exciting application of these plants is their use in the biological warfare against mosquitoes. Working independently, scientists at the Madurai Kamaraj University have successfully transferred a gene coding for a plant growth hormone called Indole Acetic Acid (IAA) from pseudomonas into a blue green algae called glococapsia.

Environment

K MINISTER PROPOSES TERNATIONAL ACCORD

Chris Patten, UK secretary of ate for the environment, has rongly criticized the environ- enatlist lobby over its handling the recent polychlorinated bi- enyl (PCB) waste controversy. No-one seriously committed to nproving our environment ould seek to manipulate and ay on public fears and worries, distorting risks and disregard- g the value and effectiveness of r monitoring and controlling ocedures, and discrediting the ndards of British technology in ste disposal," he said.

The secretary of state will be posing international coopera- n over toxic waste at the meet- on September 19 of the En- onment Council of the EC. He nts out that poorer developing untries will be unlikely to de- op suitable treatment facilities the foreseeable future, although UK has expressed its willing- ss to offer appropriate technical istance.

Developed OECD countries are a different position altogether, s Patten. He believes these ntries should aim to deal with ir own wastes, eliminating the d for inter-country movement. the September meeting Patten be looking for support from EC in promoting this approach he OECD member states.

Patten's determination over se proposals will have been ngthened by Canada's refusal accept responsibility for the oment of its waste to other countries. According to the Canadian environment authorities, it is the responsibility of the shipper to make alternative arrangements if entry into another country is refused.

In the case of the PCB waste from St Basile-le-Grand, near Montreal, the provincial government of Quebec holds the responsibility, according to the Canadian government. With regard to the other Canadian shipment refused entry at Tilbury, the responsibility rests with Dominion Textiles of Montreal.

In the UK, the Mersey Docks and Harbour Board Board is standing by its refusal to allow the unloading of PCB waste. However, Associated British Ports (ABP), owner of 21 UK ports, has said it will accept such shipments if they comply with all appropriate international regulations. Three ABP ports, Cardiff, Barry and Newport, are conveniently located for onward transportation to the original final destination, Rechem's South Wales incineration plant.

WATH RECYCLING TO SUE FMC?

UK waste management firm, Wath Recycling, of Rotherham, is threatening to sue FMC Corp, of the US, over a recent shipment of toxic waste for recycling.

Wath says it was misled by FMC about the exact composition of the 240 ton shipment, which Wath, the South Yorkshire hazardous waste authority and the UK Health & Safety Executive (HSE) all want returned to the US.

The shipment has highlighted what is seen as a loophole in UK law, which only requires that the commercial composition of waste imported for recycling to be notified. In addition the notification does not have to come from the producer of the waste, only the "holder". Much more stringent regulations cover the importation of toxic waste for disposal.

Wath says it believed the shipment was to contain copper residues and the HSE had categorized it as "hazardous and toxic," Wath claims, however, that the waste contains highly toxic impurities and is a flammable solution, possibly including xylene and furan.

It has been suggested that no UK firm could handle this particular "cocktail," but FMC is trying to locate a concern.

SWEDEN PLANS NEW LEGISLATION

Sweden is expected to introduce tough new legislation to protect the seas by curbing the flow of pollutants generated by land-based chemical and processing industries. Sweden's national environment protection board is proposing to end the dumping of wastes at sea.

The board proposes to restrict the use of nitrogen and phosphate fertilizers to certain times of the year to curb pollution of both the sea and rivers. Similarly, the board recommends the end of sea dumping within the next 15 years.

The board is calling for the establishment of an international accord designed to protect the

marine environment. The board envisages a treaty to cut discharges of heavy metals such as cadmium, mercury,, copper and lead.

The Swedish government is also considering a call for an environmental damage compensation fund.

OOSTZEE CONTROVERSY MOVES TO ROTTERDAM

Attention over the Dutch vessel, the Oostzee, and its cargo of epichlorohydrin has now moved from West Germany to the Netherlands. The Dutch authorities gave permission for the vessel to return to Rotterdam, where it docked on 12 August, after the port authorities at Groningen's Eemshaven refused permission for the vessel to be unloaded there. Rotterdam emerged as the only possible port as a result of concerns that at least 500 metres should separate the unloading from the nearest housing.

The West German authorities in Brunsbuttel gave permission for the vessel to leave for the Netherlands, despite objections from the environmental group, Greenpeace which described the decision as "hasty," saying the ship's deck was still contaminated.

Even after its departure, the Oostzee was temporarily halted outside Brunsbuttel while a [illegible] shipping [illegible] and the Rotterdam [illegible] journey, the vessel was accompanied by the Greenpeace ship, Beluga and a tow vessel.

The Dutch waste management company, Depot Milieubeheer, of Spijkenisse, will unload and clean the ship. The company started the operation at Brunsbuttel and expects this final operation to last at least a week, after which the Oostzee is expected to resume its voyage to Leningrad.

According to Depot's managing director "the assignment is a routine job. We handle this kind of work all the time."

One problem, however, is so far no shipping firm has come forward to pay for the unloading and cleaning, which means the state will have to cover the expense. The further handling of the epichlorohydrin will also be the responsibility of the Dutch environmental authorities, which are expected to order Afvalverwerking Rijinmond to complete the operation.

DOW FACES NEW WASTE HEADACHE

West German authorities in Lower Saxony have traced Dow Chemical UK as the possible source of a shipment of the pesticide chlorpyrifos which has been halted on a railway line at Seelze, near Hanover, since early July.

Transportation of the shipment was originally halted after federal railway (Bundesbahn) workers complained of a foul smell. The shipment's export papers list Bombay as the origin of the shipment which was bound for the Soviet Union via Rotterdam, in the Netherlands.

[illegible] have questioned why such a shipment should be r[illegible]ted in this way. The authorit[illegible] ordered the vessels, into wh[illegible] the drums were placed for c[illegible]rying, should be capable of p[illegible]venting any secondary leaka[illegible] as the original drums were fou[illegible] to be rusting.

According to Dow, it had su[illegible]plied chlorpyrifos to M. J. E[illegible]port in India, but understan[illegible] that the Indian concern has r[illegible]ceived an order from the Sovi[illegible] Union for the supply of the i[illegible]secticide Nurelle D.

This insecticide was formula[illegible]ed and packed by M. J. Expor[illegible] which is also responsible f[illegible] transportation of the order.

Nurelle D comprises two a[illegible]tive ingredients, the organi[illegible] phosphoric acid chlorpyrifos an[illegible] the synthetic pyrethroid cype[illegible]methrin, which are both registe[illegible]ed and licensed in West Germa[illegible]ny by the BBA

Dow says the formulation ha[illegible] a low oral toxicity but can lea[illegible] to irritation of the eyes and ski[illegible] although it is highly toxic to fis[illegible] and aquatic animals. Althoug[illegible] the company's contractual activ[illegible]ty has been concluded, Dow i[illegible] in contact with the Bundesbahn[illegible] and has offered to help solve th[illegible] problem.

UHDE WINS CONTRACT

Uhde has received a contrac[illegible] from Sandoz to build a waste[illegible] water treatment plant for th[illegible] Swiss pharmaceutical group[illegible] works at Basel, Switzerland. The Dortmund contractor will be re[illegible]ponsible for engineering, equi[illegible]ment supply, construction an[illegible] commissioning of the facility.

ne wastewater facility, which esigned to remove non-biode- dable pollutants from waste- er, will use a process licens- by Uhde from the mining re- rch company. Bergbaufor- ung, at Essen, West Germany. g with technology developed Sandoz and Uhde.

According to Uhde, the coope- on between the engineering and the drug manufacturer ws how "experienced engi- ring companies, chemical nt operators and licensors can k together to develop and im- ment forward-looking techno- es."

PONT INCINERATOR OJECT AIDED BY U.S. PACT REPORT

u Pont's plans to construct incinerator to burn hazardous tes in New Jersey state have aided by a preliminary en- nmental impact report. The rt concludes that the incine- , and associated landfill, not result in any significant rse impact "that cannot be ated." The report, which carried out by consultants on f of the state, will be open ublic comment at a meeting e held by the state authori- n September, said he Du spokesperson.

Pont expects to receive the permit for the incinerator's uction in the fourth quarter 90, and that construction will begin in the first or se- quarter of 1991. The final to operate the plant should eived between the first and quarters of 1992, when a urn will then take place. otary kiln, which will have acity to incinerate 61,000 ton/year, must have a destruction efficiency of 99.99 per cent for organic hazardous compounds.

The plant will incinerate wastes such as paint and paint ingredients, spent solvent liquids, contaminated soil, R&D polymer wastes and other types of oils. No polychlorinated biphenyls, dioxins, radioactive or pathogenic material will be accepted for disposal.

Incineration residues from the kiln will be disposed of at a secure landfill on site. Technology for the rotary kiln is likely to be supplied by a 100 per cent U.S. subsidiary of Deutsche-Babcock.

CRITICISM FOR SPD ENVIRONMENT PLAN

West Germany's environment minister, Klaus Topfer has criticized the opposition Social Democrat Party's environment plan in an effort to regain the initiative in environment policy.

Topfer called for heavy duties on carbon dioxide emissions, which at present are not covered by emission control laws. He also proposed establishing "environment police" to enforce environmental regulatory controls.

The SPD's recent proposal for a significant rise in taxes came in for criticism from Topfer, who favours a broader combination of methods, including state controls, special duties and general taxation. The unions have also criticized the SPD's proposal to increase tax on petrol, saying such a move would penalize lower income groups.

Biotechnology

PATENT DISPUTES TROUBLE U.S. BIOTECHNOLOGY FIRMS

Biotechnology firms are facing an increasingly tough time through disputes. While Hybritech and Abbott Laboratories have settled the litigation between them, Genetech, Cetus and US Biochemical Corp are all becoming further embroiled in patent disputes.

Eli Lilly subsidiary, Hybritech Inc and Abbott Laboratories have, under the terms of a confidential settlement agreement, entered into various licences and cross-licences concerning the litigated patents and related patents applications from both firms.

Under the terms of the deal the companies have agreed to drop four lawsuits associated with the immunoassay process referred to as a 'dual monoclonal sandwich assay'.

The lawsuits dropped are: an anti-trust case against Abbott, currently on appeal by Hybritech following a jury verdict in Abbott's favour; a patent suit alleging Abbott infringes Hybritech's US patents covering a method and apparatus for conducting immunoassays; and an action by Abbott, charging that Hybritech-misappropriated Abbott marketing and research trade secrets through certain former Abbott workers now employed by Hybritech.

Abbott was banned from selling immunodiagnostic kits when the Eli Lilly subsidiary brought its action against the pharmaceuticals firm. At the same time, two years ago, Hybritech forced Monoclonol Antibodies out of the market using the same patents.

Meanwhile, armed with a new patent for a recombinant technology for manufacturing tissue plasminogen activator (tpa), Genentech has filed suits for patent infringement against Wellcome Foundation, Wellcome Biotechnology, Burroughs Wellcome, Genetics Institute, Wellgen Manufacturing, GI Manufacturing and BW Manufacturing.

According to Stephen Raines, Genentech vice president of intellectual property, the new patent provides the company with significant additional patent protection.

"The patent issued will enhance our ability to prevent recombinant tpa manufactured in other countries from being imported into the US," he said.

"This additional patent further strengthens our position against Wellcome, Genetics Institute and the other defendants. In addition, it reaffirms the central role intellectual property rights play in ensuring the biotechnology industry's health," he added.

In another move into the courts, Du Pont has decided to challenge grip on the US market for the DNA amplification technique. Du Pont has asked a judge to invalidate Cetus Corp's patents for polymerase chain reaction.

Dr. Robert Fildes, Cetus Corp president and ceo, said: "We are surprised at Du Pont's aggressive accusation over the validity of our patents since most of the scientific world accepts the technology is a Cetus invention. I look upon this move as a desperate one to get into the marketplace." Fildes is confident that Cetus has nothing to fear with its strong patents position.

PCR technology is already monstrating that it could meet its huge potential. The ket for diagnostic kits based technology is estimated to worth $1.5bn by 1998. Du P had tried to license the techn gy from Cetus, but the US technology firm had already gr ted an exclusive licence to H man-La Roche.

While it has not been confir ed, it is understood that Du P is developing some diagnos kits which it is readying for marketplace at the end of t yeor.

Fildes believes Du Pont's mo may be an attempt to pre-em moves by Cetus to sue for paten infringement ig these produc are based on PCR technology. " that is the case we will defen our position," said Fildes.

US Biochemical and Harvar University are also attempting protect what they claim is the intellectual property from Swe dish drugs and bio.echnolog concern, Pharmacia. The two U outfits claim Pharmacia is violat ing a polymerase-based sequenc ing technology developed an patented by Harvard Medica School.

Harvard and its exclusive licen see, US Biochemical, which mar kets the technology under the tra dename **Sequenase**, are seeking to stop Pharmacia and three sub sidiaries from using the technolo gy and claiming retrospective da mages.

Jorgen Winroth, a vice pres ent of Pharmacia Inc., explains that the DNA sequencing pr ducts in question are only $500,000 year business, a stressed his company respect patents as he hoped other com nies would do. He is confid the suit will be settled amica

Plastic Markets Abroad

POLYMERS PLAYERS POSITION FOR AUTUMN MARKET

As market players look towards the end of the summer season, a vigorous attempt to position for September is getting underway. Producers insist destocking has been fully achieved and it is felt convertors will be forced to buy in quantities to meet their needs for September.

Overall, it seems this summer has seen a return to the traditional seasonal approach to the market. Throughout the summers of both 1987 and 1988, the market remained tight and supplies continued to be in short supply. A summer slowdown did not materialize. Producers have continued with maximum production in an attempt to rebuild stocks or to position themselves for the autumn. This year, players say the summer season has seen demand fall away by some 15-20 per cent — a normal seasonal adjustment.

To what extent demand and buying interest will be revived, as the summer recedes in September and October, is currently a largely speculative question for the polymers market. Although producers are confident that the market has suffered one of the swiftest cyclical shifts in recent times, and so is now leading into a upturn, this has yet to be confirmed by industry statistics.

Plastics price report (DM/kg)

Product	Market Price	
	July	August
High density polyethylene (hdPE)		
Injection moulding	1.85-2.10	1.80-2.10
Film (extrusion) grade	2.10-2.20	2.00-2.20
Blow moulding	2.05-2.10	2.00-2.10
Linear low density polyethylene (lldPE)		
Film grade (butene-based)	1.40-1.55	1.45-1.55
Low density polyethylene (ldPE)		
Film grade	1.40-1.55	1.45-1.55
Polypropylene (PP)		
Raffia grade	1.55-1.60	1.50-1.60
Injection moulding	1.60-1.80	1.60-1.75
Copolymer	1.90-2.10	1.90-2.10
Polystyrene (PS)		
General purpose	2.50-2.70	2.45-2.55
High impact	2.50-2.80	2.50-2.75
Polyvinyl chloride (PVC)		
Suspension	1.82-1.88	1.82-1.88

The left hand column gives a guide to price levels for large-to-medium size buyers and for general purpose grades in July. The right hand column shows the lat-est prices in August.

Convertors continue to limit purchases to a minimum level for immediate needs and it seems commitments will no longer be made until the market shows clearer signs of direction. While there is any hope of price slippage, no buying of over two to three weeks will take place.

While lldPE prices have slumped, ldPE has been the polymer to suffer the worst price erosion, dragging butene-based lldPE numbers down. Prices for ldPE fell from DM1.95-2.00/kg at the end of quarter one to finally bottom out at DM1.30/kg into the third quarter. The overall impression is that the product entered some form of freefall and players lost control as the downward price spiral gained its own momentum. Now prices have begun to rise, reaching a level of DM1.45-1.55/kg.

Producers are taking an optimistic outlook with many posting August figures in the range DM 1.55-1.65/kg. So far there has been little information to suggest these figures have been achieved by makers. In the meantime, customers are attempting to make the most of their strong position. Many convertors insist destocking is still underway, denying there is any reason to increase prompt buying in the short-term.

The slump in ldPE prices has strongly affected the lldPE market, which can be closely linked with low density polyethylene. Most converters can decide how much butene-based lldPE and ldPE to use in their particular blends; it is mainly a question of economics. When ldPE prices began to drift down, butene-based based lldPE also fell, in an at-

tempt to remain competitive, to a level of DM1.30-1.35 kg, although the product has a great deal of potential to explore new market niches.

It is true to say that lldPE numbers have shown signs of recovery and most market sources are now quoting rates in the range of DM1.45-1.55/kg. Though some producers claim higher list prices, these have yet to be confirmed.

Though butene based lldPE has suffered a price crash, the higher olefin octine-based material has shown amazing resistance to a price slump. Product is now quoted in the range of DM1.95-2.05/kg, maintaining a healthy margin between grades. Players argue that the specialist nature of octene-based material has protected it from the ravages that have hit more general purpose polymers.

Downward price influences continue to be exerted on hdPE, this is especially true of high volume, general purpose grades, such as injection moulding. Cheaper export material from the Eastern block and Latin America is still destabilizing price ideas. Players complain that relatively small amounts of export product have a disproportionate effect on market perceptions, leading to fluctuating prices.

Convertors argue that substitution with cheaper polypropylene injection moulding is toking place, so further undermining hdPE prices. However, observers stress that the trend toward substitutions is virtually spent, having little future affect on price settlements.

Injection moulding prices have slipped 5 pf/kg to stand at DM 1.80-210/kg. Film grade product which has faced intense competition from ldPE film grade has dropped to DM2.00-2.20/kg with specialist applications retaining a premium. The one grade of hdPE to resist any major price erosion is blow moulding, which is stable at DM2.00-2.10 kg.

Polypropylene shows little signs of recovery, labouring under the weight of oversupply. Upto 250,000 ton/year of new capacity is due on stream before the year end, offering the threat of more price dips.

Reflecting the slump in prices, raffia grade product has dropped to DM1.50-1.60/kg with injection moulding at DM1.60-1.75/kg. Copolymer remains basically unchanged at DM1.90-2.10/kg. Producers will have to close old capacities to stabilize the market. Although some players have initiated such measures, it has had little effect on prices.

As predicted last month, polystyrene has undergone a price fall with oversupply affecting the market Cheaper styrene monomer has encouraged polystyrene production, leading to high stocks and lower numbers. General purpose grades have drifted down to DM2.45-2.55/kg, while high impact is down to DM2.50-2.75/kg. Meanwhile, reduced prices in the Far East, now at $900/ton cif Far East, have added to the perception of a weakening market.

PVC remains the most stable polymer in the market, with prices for suspension grade unchanged at DM1.82-1.88/kg. Players say a balanced market coupled with a lack of structural change has kept prices virtually static.

News About New Projects

HONG KONG PETROCHEMICAL CONFIRMS PS PROJECT

Hong Kong Petrochemical has confirmed plans to proceed with a new polystyrene facility in Hong Kong. The Montedipe/China International Trust & Investment Corp. joint venture has signed a lease for a one hectare site on the Yuen Long Industrial estate, an extension to the 2 hectares the firm leased last year; and the first to be signed since the upheaval in the Peoples' Republic.

Confidence in Hong Kong was badly shaken by the Chinese army's suppression of pro-democrats in Beijing two months ago. The fact that a Western multinational should lease extra land "is really very good news," said Tony Savage, chief executive of Hong Kong Industrial Estate Corp. This decision "tends to indicate there is no adverse effect on demand" after China's turmoil, he added.

Hong Kong Petrochemical first unveiled plans for the unit last year. The company refuses to disclose either the investment or capacity involved, although industry sources have suggested that the plant will output some 90,000-100,000 ton/year. Savage reckons the plant will now cost $77m, against the $100m first estimated by industry sources.

Due on-stream within 18 months, the plant will be producing polystyrene for Hong Kong companies, though some is likely to be shipped to the People's Republic. Styrene monomer will be imported from Italy.

Hong Kong bought some 300,000 ton of polystyrene last year, of which up to half was reshipped into China, according to industry estimates.

ARCO EXPANDS POLYOLS AND PO

Arco Chemical is expanding its European production of polyols and propylene oxide (PO). The company is planning a 100,000 ton/year facility to manufacture both conventional and polymer polyols at its Fos-sur-Mer, France site. The company is also debottlenecking its PO capacity by 50,000 ton/year to bring it to a total of 200,000 ton/year at the site.

The polyols investment, which an Arco spokesman would only describe as "a substantial expansion," will allow the company to maintain its position as a leading player in the European market. Arco currently operates a 70,000 ton/year facility in Rieme, Belgium.

An operating agreement with Atochem to produce 38,500 ton/year of polyols in Lavera, France, is to be terminated in the third quarter of 1990; the same time as the Fos-sur-Mer unit comes on-stream.

Simultaneously, Arco intends to expand production of PO feedstock by 50,000 ton/year, with an accompanying 130,000 ton/year, increase in methyl tertiary butyl ether (MTBE) output at Fos-sur-Mer. Currently, the site produces 150,000 ton/year PO and 360,000 ton/year tertiary butyl alcohol, an MTBE feedstock.

FIRMS BID FOR BRAZILIAN PLANTS

Two firms have emerged as bidders to establish ethylbenzene, styrene and polystyrene units at the plasned Itaguai petrochemicals complex in Rio de Janeiro state, Brazil, Companhia Brasileira de Estireno (CBE) is proposing a $140m investment; Estireno do Nordeste (EDN), a $170m project.

CBE director president, Takashi Sanefuji revealed plans to build a plant capable of producing ethylbenzene (240,000 ton/year), styrene (150,000 ton/year) and polystyrene (50,000 ton/year). CBE proposes to begin construction in 1992, with the plant due on-stream in 1995.

EDN, Brazil's largest styrene and polystyrene producer, is proposing to build a plant to produce ethylbenzene (240,000 ton/year), styrene (150,000 ton/year) and polystyrene (75,000 year). Meanwhile, CBE is investing $12m to increase styren output at Cubatao by 31 per cent to 105,000 ton/year. CBE is owned by Monsanto do Brazil (48 per cent), Petroquisa (23 per cent), West German-owned Huls do Brazil (18 per cent) and Unigel (10 per cent).

DOW INVESTS $150M

Dow Chemical Iberica, the Spanish subsidiary of Dow, has confirmed plans to invest $150m over the next three years to expand manufacturing capacity. The expansions include increasing the Tarragona ethylene capacity to 465,000 ton/year and low density polyethylene to 150,000 ton/year.

In 1988, the Tarragona cracker produced 420,000 ton/year ethylene, 198,400 ton/year propylene and 302,000 ton/year of pyrolysis gases. Dow Iberica's pretax profits in 1988 jumped 126 per cent to $138m, on total sales of $697m, up 17 per cent on 1987.

Technological Scene Abroad

SOVIET CLIMATOLOGIST SCOFFS AT FEARS OF GLOBAL WARMING

The man who first predicted that the greenhouse effect could warm the planet in the coming decades now says that the warming is beneficial and should be encouraged. He envisages cattle grazing in what is now the Sahara desert and crops growing in arid parts of central Asia.

Mikhail Budyko, the Soviet Union's leading climatologist, will play a key role in one of the working groups of the U.N.'s Intergovernmental Panel on Climatic Change chaired by the Soviet Union. The panel is currently preparing advice for the world's politicians on the likely effects of global warming.

Unlike most Western climatologists, Budyko dismisses fears that the centres of continents, such as the grain belts of the American Midwest and the Ukraine, will dry out. Any drying will be temporary, he says, and will give way to wetter times and bumper harvests by the middle of the next century, provided that global warming is allowed to continue. "Limiting carbon fuel consumption will be not only useless, but even dangerous," he told a recent scientific meeting in the West.

Budyko, like most Western scientists, expects that without drastic efforts to halt the greenhouse effect, mean global temperatures will rise by perhaps 1°C by the year 2000, by 2.5°C by 2025 and by 4°C by 2050. He believes that each of these predictions has an analogue from the past. The conditions predicted for the year 2000 correspond to temperatures that occurred 6000 years ago, the warmest time since the most recent glociation.

Temperatures in 2025 will match those at the warmest phase of the previous interglacial era, 125,000 years ago. And by 2050, when levels of carbon dioxide in the air are expected to have reached double those of preindustrial times, temperatures will be as hot as the "Pliocene climatic optimum," which occurred around four million years ago.

Budyko presented some of his results to a meeting in West Germany last November. His broad conclusion was that, rather than holding back the greenhouse warming, it might be best for the world to hurry forward to a time when temperatures will reach those of the Pliocene optimum.

He agreed that, by analogy with climates 6,000 years ago, soils could dry out in temperate latitudes in the immediate future, losing 10 to 20 per cent of their moisture. But by 2050, according to his Pliocene model, the world would become wetter as well as hotter. This, together with a "fertilization effect" on plants caused by increasing concentrations of carbon dioxide in the air, would raise yields by around 50 per cent, he says. But other scientists suggest that extra carbon dioxide would have little effect on the growth of crops.

By contrast, Western comput models predict that the interior continents will become increasingly dry, causing crops to f in currently fertile areas. B they also predict that other r gions, such as those with northe climates or monsoons, may b come more productive.

American climatologists are e tremely sceptical about Budyko predictions. They warn that dat about past climates are extremel fragmentary. Data for Budyko' maps of Pliocene conditions wer collected from remains differin in age from three million to 4.5 million years old. And they warn that conditions in the modern world, including sea levels, ar very different.

DRUG-DELIVERY TECHNOLOGY

A patent covering a mucoadhesion drug delivery system is among the Bio-Mimetics (Lexington, MA) assets being purchased by Columbia Laboratories (Miami). The mucoadhesion technique "enables a pharmaceutical to pass through the mucous membrane directly into the bloodstream, avoiding the first past through the liver," Columbia says. The company has signed an agreement to pick up a one-third interest in the mucoadhesion and other patents, and will have the option to purchase the outstanding assets. Columbia, which is basing many products under development on the mucoadhesio delivery system, is "now in a po sition to ensure that the technolo gy is developed as rapidly as pos sible," says president and CE Norman M. Meier. Bio-Mimeti will receive $2.5 million and a 1% royalty on sales.

CHEMICAL WEEKLY
SUPPLEMENT ON
LEATHER PROCESSING

Quality Control of Shoe Upper Leather*

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In the recent years, the developments in the shoe and leather ndustries as well as the textile industry have shown that great efforts have to be made to comply with the everchanging demands of fashion. To meet the requirements of high fashion designers, more importance must often be attached to the appearance than to the physical properties of the leather. The consumer, however, expects a high fashion article to be of he same quality as a less fashionable, classical product with egard to material and workmanship.

In reviewing the fashionable types of leather, I should like o deal first with the leather as such and then with the finish. n the recent years, fashionable soft leathers have been used n an increasingly larger scale for the manufacture of foot-ear and this trend seems to continue.

Very soft leathers, however, involve considerable problems, ecause they have to be reinforced and interlined to render em suitable for processing into foot-wear. The require-ents imposed on upper leather differ substantially from the pes used for the manufacture of clothing, fancy articles and gs. To explain the reasons for the difficulties involved in eeting these requirements, I have to go more into details. ne types of leather that we have to deal with are chiefly ppa hides and goatskins which are now required to be very uch softer than only a few years ago.

Other types of leather include bastardskins and lambskins at are used in increasing quantities for foot-wear manufac-e not only because of their softness but also to solve the pply problem in the upper leather sector. It should be inted out that a tanner producing a leather often does not ow that it will be used for the manufacture of shoes. To et fashion requirements, leathers similar to those for gar-nts and bags are often used for footwear without giving nsideration to the severe stressing to which shoes are sub-tted during wear. This is the reason why the leather has be reinforced and interlined for shoe production.

The softness required is imparted to the leather during tan-nage in the opening-up process that produces a soft, loose fibre structure. Suppleness is achieved by fatliquoring and retanning. In this connection, I should like to describe the sturcture problems of the leathers first and the finishing pro-blems later on.

The soft leathers that we have to deal with are chiefly hides and calfskins including glazed kid that have been submitted to a strong opening-up process. Bastardskins and lambskins also give rise to the same sort of troubles. With all these types of leather, especially with lambskins, the loose structure or high stretch and the low cohesion within the skin may result in pipiness.

The soft leathers are extremely extensible and particularly their permanent distention value is very high. This has been dealt with in various studies of our institute where instru-ments have been developed for measuring the distention and permanent distention under a very low force, e.g., 750 mbar simulating the conditions that occur when shoes are worn.

The values determined in the tests show that the permanent distention of normal leathers lies at 2-3%, that of softer leathers at 3-5% and that of extremely soft leathers at 6-9%. This makes clear how great the differences are. It also shows that certain measures have to be taken when the leathers are used for the production of foot-wear to avoid the excessive widening of the leather or the shoes during wear. For this reason, care must be taken in reinforcing the leathers with a suitable interlining.

In the shoe factory, the structure problem becomes very distinctly apparent when the leather has to be laminated with an interlining or when reinforcements have to be bonded to the underside of the leather in the tip and heel area of shoe uppers, as is normally done anyway.

The leathers tend to wrinkle particularly in the areas where they are excessively soft. In extreme cases, even the smal-lest fixation on the underside of the leather may cause unde-

Paper presented at the 24th Tanners Get-together, held at CLRI Madras anuary 1989.

sirable wrinkles to form on the grain side. It may well happen that a leather showing this behaviour is no longer suitable for shoe production. There is frequently reason for this kind of complaints which often leads to unfriendly discussions between leather producers and shoe manufacturers.

Deficiencies of this kind are normally not visible on the leather until it is laminated with a reinforcement material or fixed lightly on the reverse side.

Such defects can be simply detected by sticking a strip of adhesive tape to the flesh side of the leather and bending it in the direction of the grain side. The place where the adhesive tape is attached to the flesh side will then become visible on the grain side. This can serve as an indication that the leather will cause trouble in shoe production. I have already mentioned that all leathers have to be reinforced anyway for footwear production. This fact should be considered in the leather production process to avoid any excessive opening up of the hides and skins. It should also be pointed out that in using leathers for foot-wear production, the adhesive used should be applied only to the lining or interlining and in lamination by plating the adhesive should be applied in spots.

On patent leathers, wrinkling and loose grain will appear even more pronounced when the reverse side is fixed or laminated with an interlining. Patent leather should therefore not be as soft as nappa leather or other types of soft leather. Grain cracking, a problem formerly often encountered in shoe manufacture, hardly occurs any more, because of the moistening devices that are installed. Any grain cracking still occurring today is usually due to a defect of the tanning process.

Another point that I should like to outline briefly is that regarding the fatliquoring of modern soft leathers. But first let us discuss the problem of stains caused by fatty spue.

Fatty spue formation on finished shoes and leathers has been lately observed more frequently. Although it has no direct effect on the quality of the leather, this deficiency is not acceptable by shoe sellers, because they cannot be expected to wipe the spue continously from the shoes before they can be sold. Fatty spue is often due not only to the amount but also to the composition of the fatliquoring agent or fatliquoring mixture used.

Fatty spue usually forms when the fatliquoring mixture contains a very large proportion of hard fat. Excessive amounts of fat, of course, are the actual cause of fatty spue but the proportion of hard fat plays a decisive role.

When the fat in the leather is degraded by bacteria, the resulting free fatty acids with a high melting point may also cause formation of fatty spue. Attention should be paid t the fact that it is not absolutely necessary to use a very larg amount of fat for the production of soft leathers. This shoul be kept in mind especially when the skins contain a larg amount of natural grease as, for instance, the bastard an lambskins. The high fat content of the leathers interferes wit the shoe production process and provisions should be mad to ensure that the extractable fat content of the leathers does not exceed 12 %.

In this connection, we should also go briefly into two problems that are often the subjects of complaint, viz. the odour of the leather and formation of mould.

Especially in your countries, it is important that suitable products of good quality are used for fatliquoring and that the leathers are properly treated in an odourless preserving process, because it often happens that mould growth is promoted by high humidity and heat during transportation. The offensive odour of leathers imported by us often gives rise to complaints. In many instances, analytical examinations have revealed that the odour has been caused by unsuitable or contaminated preserving agents. There are, of course, also cases where poor quality fatliquors have caused the offensive odour to which consumers rightly object.

Tests have also revealed the presence of phenolic compounds which cause objectionable odour. It should be pointed out that this has been observed in an increasingly greater number of cases and that the problem of objectionable odour should also be considered by the tanners producing pretanned leathers. It is also possible that wetblues and crust leathers already have an offensive odour.

As I have mentioned just now, the cases of mould growth on upper leather are occurring with increasingly greater frequency. This, of course, may also be due to the modified regulations concerning the use of preserving agents.

These points should be closely observed and corrections should be made to avoid difficulties during transportation and with dissatisfied consumers. And now to the finish problems. The object of finishing is to impart the desired appearance to the leather and to protect it from damage. The finish is therefore of decisive importance with regard to the suitability of the leather for the purpose intended, provided, of course, that the leather as such is in a perfect condition. This has been the case in 90 % of the complaints received. The types of finish required for fashionable leathers have changed considerably in the past few years. Only 15 years ago, strongly pigmented finishes used to be customary, whilst today more or less transparent aniline finishes are predominating.

The shade of a leather, of course, is a very important factor.

The colour fastness that the leathers to be processed without lining or the lining leathers themselves are required to possess is of special significance. The leathers are mainly required to possess satisfactory colour fastness, wet rub fastness and fastness to perspiration. These are the requisite properties which an upper leather has to possess and which normally can be readily achieved, if suitable dyes of perfect quality are used and the colouring process is carried out properly. The requirements imposed on the rub fastness properties, however, are much more difficult to meet on full grain leather by dyeing and light finishing than on lightly buffed or corrected grain leathers by application of fairly thick pigment finishes. The reason for this is that better adhesion of the finish is achieved on a rough corrected grain surface than on a relatively smooth full grain surface.

The adhesion of the finish is decisive for the flexing endurance of the finished leather. Adhesion and flexing endurance are dependent largely on the finishing products and the finishing method used.

Since the base coat formulation, which is usually based on dispersions, can penetrate a corrected or buffed grain surface more readily than a closed full grain surface, the anchorage of the base coat achieved is accordingly so. The depth of penetration of the base coat formulation, of course, is also dependent on the fineness of the dispersion used. In this respect, considerable improvements have been made. Even wet adhesion values that fully meet the requirements imposed can now be obtained on full grain leathers.

The solution to these problems is particularly important today, because increasingly greater efforts are now being made to work solely with aqueous finishing products. The requirements imposed, however, are more difficult to meet with water-based than with solvent-based finishes. I feel sure that solutions will be found to this problem, if no excessively high physical requirements are imposed which cannot always be met anyway in the fashion sector.

A certain minimum degree of adhesion of the finish, however, has to be maintained, in order to ensure that satisfactory wear properties can be achieved. Because in the shoe factory, an additional coat of finish is applied at the end of the manufacturing process to give the shoes a certain finishing touch.

This additional finishing coat increases the physical load on the original finish of the leather. This may cause trouble on leathers with aniline finishes that may not have shown any reason for objections in a previous superficial flexometer test. Even extremely fine hair cracks in the finish of this kind may cause trouble on the finished shoe, if the final finishing coat is applied to the shoes in the manufacturing process. The use of a finish based on wax with less pronounced film forming properties would be more suitable for this purpose.

It should be pointed out specifically that the wet adhesion of the finish is of very great importance. It often happens that the base coat softens under the action of moisture and as a result the adhesion of the finish is impaired. Special attention should therefore be paid to the application of the base coat, because the quality of the leather is largely dependent on the care exercised in formulating and applying the right base coat.

The fatliquoring of the leather also has a great influence on the adhesion of the finish. Better adhesion on the fatliquored leathers is achieved with solvent-based finishes than with aqueous finishes. Care should be taken that the base coat and the top coat are suited to one another, i.e., they should posses the same elasticity and physical properties, as otherwise trouble is to be expected. Mistakes are often made in this respect.

The finish has to meet certain dry and wet rub fastness requirements, in order to allow proper leather care to be carried out. If these requirements are not fulfilled, troubles will result in the shoe manufacturing process. Stain marks left on the leather of the shoe during the manufacturing process have to be removed by washing and trouble is caused, if the leathers do not possess satisfactory fastness properties in this respect. Poor fastness properties will reduce the wear properties of the shoes.

Stains may easily form on the leather that does not stand up to normal leather care. Another property that especially the light-coloured leathers should possess is light fastness and fastness to change of shade that occurs under the action of heat after exposure to light. These properties are largely dependent on the kind of finish applied and on the binders used in the finishing formulations. I guess you know how important the light fastness is and that you are familiar with the problems involved. Satisfactory heat resistance is a property that is difficult to achieve.

It is of equal importance that light-coloured leathers possess satisfactory cold crack resistance. To meet this requirement the finish of the leather must have sufficient elasticity. With light-coloured leathers, the problem is not so easy to solve because of the high proportion of pigments contained in the finish.

Although it is not so serious in your country, this problem plays a decisive role when the shoes or leathers are exported. At sub-zero temperatures between 0 and -10°C or even -15°C which may well occur in Europe, cold-crack damage may be caused to the leathers or shoes even during transportation.

In the recent years, there have been numerous complaints about the discoloration of leathers that have been processed in combination with polyurethane sole material. It is a well known fact that polyurethane in conjunction with nitrocellulose causes yellowing and destruction of the finish due to the accelerator in the polyurethane system.

Attention should be drawn to the fact that even the smallest proportion of nitrocellulose, not only in the top coat, will bring about this kind of discoloration. No product has been found yet that could replace the accelerator (Dabco) in polyurethane. For this reason, the leathers that are to be processed in conjunction with polyurethane should be free of nitrocellulose.

Finally, it should be pointed out that it is important to test and determine the tendency of the leathers to discoloration in conjunction with adhesives. Discolorations that occur on shoes, however, are usually not due to faults of the leather but to the adhesives which may contain substances that have a discolouring effect on the finish of the leather.

ABSTRACTS

Polymers in the wet-end — investigations into the reactivity and mode of reaction, B. Magerbath. *The Leath. Manufacturer*, **107**, (4), 1989.

Water soluble polymers have become a widely used auxiliary with retannage of all types of leather. The majority of polymers used nowadays are polyacrylates, polymethacrylates or copolymers with a number of carboxyl groups that still ensure their solubility in the weakly acid pH range. Apart from some low molecular weight products based on methacrylic acid, the majority of water soluble polymers have no major affinities for native collagen. On chrome leather, the same polymers are fixed in a relatively rapid manner. From this it can be concluded that their fixation to the skin is due to the fact that their carboxyl groups form complex bonds with the chromium tanned skin. This paper presents more information obtained by systematic laboratory experiments.

Ecological pressures force change, A.D. Crompton, *World Leather*, **1**, (8) 10, 1989.

Renewed pressure on tanners regarding chrome levels waste water will lead to radical changes away from tradition tanning. Novel approaches to tanning have been a feature the 1980s and others are in the pipeline. The author of th article looks at where we are and where we are heading

Various methods to control the quality of dyestuffs and pi ments, D. Lach, *J. Am. Leath. Chem. Abstr.* **84**, (7) 704, 198

This paper presents various methods to control the quali of dyestuffs and pigments on the side of the producer an on the side of the buyer. The general idea is two fold. T show how the producer can guarantee constant quality by thorough process control and to explain two versatile ine pensive methods, which can be used by everyone.

The dyeing of cowhide split leathers, C.D. Albee, *J. An Leath. Chem. Abst.* **84**, (7), 219, 1989. In this paper th methods of dyeing chrome cowhide splits and some of th problems that may have to be dealt with are discussed.

NEWS FROM ABROAD

CROCODILE LEATHER

Crocodile skins can now be tanned in Australia after the Federal Government's recent decision to grant the first domestic licence to tan crocodile skins. Crocodile farmers can now sell the skin of their animals to any Australian tanner. The finished products are presently sold to Australian manufacturers and marketed through Victorian and South Australian retailers. *Leather, **191,*** (4570), 1989.

BRILLIANT WHITE FINISHES

A complete new family of brilliant blue-white finishes has been introduced by Stahl GB Ltd. for finishing pure white full and corrected grain leather. All are nitrocellulose free and non yellowing, offering excellent coverage and resistance to the discolouring effects of ingrained dirt. *World Leather, **1,*** (8), 1989.

NEW TANNING SOURCE

Loranthas Slobosus, a parasite plant on mango and other trees could become a useful source of tanning material for the leather industry. Quantitative analysis by the leath research division of BCSIR, Dhaka, Bangladesh, has show that the bark contains 17.4% tannin (pyrogallol and catech types) which can produce a full, pliable and soft leather. can also be used to retan a chrome crust leather. *Wor Leather, **(1),*** (8), 1989.

US LEATHER INDUSTRY

The US Leather industry set an all time record for expor last year, crossing the magic half billion dollar mark. At $50 million leather exports are up $110 million on 1987 an increased by $46 million on the four Targeted Export Assi tance Markets. *Leather, **191,*** (4570), 1989.

TWENTIETH CONGRESS

The XXth Congress of the International Union of Leath Technologists and Chemists Society will be held in Phil delphia, USA from October 15-19, 1989. A total of 64 tec nical presentations are scheduled for the congress. A full da symposium on non-chrome tanning consisting of 10 lectur and a discussion session is included. 27 lectures covering wide variety of subjects are scheduled during three days

the congress and an additional 28 posters will be displayed each day at show time and after the lectures. *Leather, 191,* (4570), 1989.

SANDOZ-QUINN AT THE SEMAINE INTERNATIONALE DU CUIR 1989 IN PARIS

This year at the Sandoz-Quinn stand, the specialist will find a wide palette of all leather types in demand: cowhide, sheepskin, goatskin and pigskin leathers for the main sectors of

— Shoe upper leather
— Furniture and car upholstery leather
— Garment leather
— Woolled skins, especially for garments.

Forefront among the new products that will be displayed is Sandotherm® Black R, a high-quality dye with high fastness level, specially suited for dyeing aniline upholstery and garment leather, alone or in combination with other dyes from the Sandotherm® range.

Of exceptional interest are the following new chemicals:
— Tergolix® AN Liquid: Dispersing and degreasing agent
— Tergolix® CA Liquid: Degreasing agent for raw skins with high natural fat content
— Tergotan® FI Liquid: New-type filling agent
— Tergotan® MC Liquid: Polymer retanning agent
— Tergotan® NT Liquid: Syntan, also for application in chrome tanning to improve chrome uptake and fixation
— Dermagen® PE Liquid: Dyeing assistant for levelling and penetration.

Finishing will not be neglected in the exhibit programme. Fashion trends and classic styles in all variants of modern, rational finishing techniques, taking into account environmental considerations, will form the cornerstone of the collection. Low-solvent and all water-based finishes are resolutely being promoted by SANDOZ-QUINN as before.

A new system specially developed for upholstery leathers, fancy goods and upper leather is the CS Finishing System. This allows the production of high-class, soft and at the same time fast finishes on buffed leathers while still retaining the crust properties.

The new Nappalan Compact Finish, using the new Melio® Resin A-816, is sure to meet with enthusiastic interest on the part of finishing experts, since it uses only one product instead of a complicated formula.

Along with proven products, the following new products will be shown:
— Lesan® Ground HR: For high-quality finishes on splits with outstanding fastness properties and attractive economy.
— Melio® EW-342: Water based nitro emulsion lacquer with high fastness properties and lustre.
— Melio® EW-635: Water-based, lustrous, nitrocellulose-free emulsion lacquer.
— Melio® EW-D-628: Water-based, matt, nitrocellulose-free emulsion lacquer with pleasing handle.
— Melio PU-552: High-quality, aliphatic PUR lacquer, suitable for all upholstery leathers with high fastness requirements.
— Melio® Promul AP-38: Water-based adhesion binder for water-repellent leather surfaces.
— Melio® OF-5211: Smooth handle modifier for lacquers containing organic solvent.
— Melio® OF-5214: Specially developed handle modifier for aliphatic PUR lacquers containing organic solvent.
— Nappaderm® T pigments: With high brilliance and transparency along with outstanding fastness to light and migration into plasticised PVC.

INDIAN LEATHER SCENE

MACRO POLICY FOR LEATHER INDUSTRY HINTED AT

The Union government seems to be in a favour of a macro-policy for the leather sector supported by a modernisation fund to accelerate technology upgradation.

The success of the Indian leather industry in recent years has led to the government to declare the industry as a thrust export sector. Total exports from this sector in 1988-89 touched Rs. 1,608.37 crores — an increase of 29.2 per cent over the 1987-88 export figure of Rs. 1,244.86 crores. However, it is generally felt that appropriate long-term policies can help the industry to substantially increase exports. But even at Rs. 1,608 crores, India accounts only for 2.6 per cent of the total global imports.

An inkling of which way the union government's mind is working is provided by the Planning Commission member, Dr. Abid Hussain's support of a proposal of the Indian Leather Technologists' Association (ILTA) for formulation of a macro-policy and setting up of a Leather Development Fund.

In a communication to ILTA, Dr. Hussain said a long-term policy together with creating of infrastructural facilities was urgently called for in this sector mentioning that he would take up the matter of a development fund with the appropriate authorities. Dr. Hussain endorsed the need for modernisation and technology upgradation.

Dr. Hussain's observation was in reply to a macro-policy outlined by Mr. Sanjoy Sen, the ILTA president, Mr. Sen had pointed out that a long-term policy must be evolved to achieve the Eighth Plan export target of Rs. 3,600 crores. According to him, the policy must cover all segments of the leather industry from commercial animal husbandry, manpower training to updating technology at all levels.

Identifying the inelastic supply of raw materials as a major constraint, Mr. Sen said steps should be taken to enhance the realisation per unit area of leather by at least two to three times. He recommended technology upgradation and evolution of a marketing strategy aimed at tapping the top end of the international market in this context. He also advocated better collection of hides and skins and commercial farming for augmenting raw materials supply.

However, he emphasised that tapping the value-added products market would require stringent quality control and modern facilities. Production of uniform and consistent quality of leather and uniform dyeing can only be achieved by introducing rigid process and programme control. He recommended introducing appropriate process control in a semi-automatic manner for small tanneries and computer-aided control of larger ones.

In the finishing sector, he said, units must set up plants with the latest technology and fully exploit computerisation for both design and process control. This was imperative for tapping the booming international demand for products like full footwear, athletic shoes and fashion garments. The US, FRG, Japan and the UK alone accounted for $2,250 million worth of leather garments import in 1988-89.

The modernisation effort is expected to entail an expenditure of around Rs. 250 crores to Rs. 300 crores. Given the financial constraints within which the industry operates, Mr. Sen said it was not feasible for industry to generate the requirement alone. In this context, he said the Planning Commission should recommend a provision in the Eighth Plan for modernisation, rehabilitation and eradication of obsolescence in the leather and footwear industry. The provision, he added should be made on the basis of soft long-term loans.

In the event of a positive government initiative, Mr. Sen expressed optimism that India could well forge ahead of established leather products exporting countries like Taiwan and Thailand.

LEATHER INDUSTRY URGED TO USE LOCAL MATERIALS

The Union Government is keen on taking policy measures to develop the leather sector. According to the Union minister of state for chemicals and petrochemicals, Mr. P. Namgyal, the government was determined to promote this sector. Mr. Namgyal, who was delivering the inaugural address at a seminar on 'New developments in leather processing and management of tannery waste' organised by the Chemtech Foundation at Calcutta September 7 urged industry to give concrete proposals to the government for accelerating development in this sector.

The minister expressed optimism over the performance of the leather sector. During the 7th Plan period, the leather sector has grown at a rate of 28 per cent while exports has registered a growth of 42 per cent. In this connection, he the government has been consistently liberalising its

ng policy in respect of leather chemicals, both in terms of iberalising procedures and reducing import duty, to boost xports.

Mr. Namgyal said his ministry was against imports where ocal supplies were available. Mentioning that quality of hemicals should not be compromised, he urged industry to irst utilise domestic supplies before resorting to import. However, he admitted that leather chemical manufacturers were xperiencing shortage of some basic raw materials like henol, ethylene oxide, paraffin wax and butyl acrylate.

He called upon industry to take up modernisation efforts s presently hides are processed with obsolete machinery and utdated techniques. While emphasising the need for modernisation, he said adequate attention will also have to be paid o environmental protection.

In his address, Mr. S. Chaliha, chairman and managing irector of Oil India and the Eastern India, chairman of Chemech, said if India was to capitalise on the success in the international market, manufacturers have to take a look at modern echnologies, more reactive compounds and leather chemicals. In this regard, he hoped that the Chemtech seminar ould play a role in disseminating information on new developments in leather processing.

Mr. Jasu Shah, Chemtech president, said the foundation, hich has the objective of indigenisation and modernisation f the process industry through technology transfer and pgradation has identified three thrust areas for activity improving techno-economic efficiency, better energy conervation, and industrial pollution control and safety.

As part of its efforts, the foundation is leading a high-ower delegation to France in October to focus on latest techology developments. The French, he added, are not only nterested in selling technology but also in entering into buyack arrangements. The foundation is also planning a US tour ater in the year.

XPORT OF SEMI-PROCESSED LEATHER TO BE 'HASED OUT

The export of semi processed leather is to be phased out otally, so as to soon complete the final stage of India's transormation from an exporter of mainly semiprocessed leather o an exporter of value-added high quality leather products. he export strategy for the leather sector, currently being inalised in consultation with the Council for Leather Exports CLE) and other organisations, is likely to be announced soon, ccording to the minister of state for commerce, Mr. P.R. Das unshi, whose address to the council's annual general meetng was read out in his absence.

The leather sector's export performance has been impressive. For instance, its exports rose sharply to Rs. 1,608 crores in 1988-89 from Rs. 1,245 crores in the previous year. The performance in the current year so far has also been encouraging. The export target for 1989-90 is Rs. 2,000 crores.

Earlier, the CLE chairman, Mr. M.M. Hashim, urged the government to create a special fund for modernisation of the leather industry. It could be operated by the Industrial Development Bank of India (IDBI). In his view, it might follow the pattern of the engineering sector. Modernisation has become imperative to improve the quality of Indian leather items which would face more competition from countries like China, South Korea and Taiwan, he pointed out.

He exhorted the exporters to earmark at least 2 per cent of the price of a product for design development which was crucial for manufacturing "better goods at better prices". He underlined the need for choosing the right buyers abroad. This, of course, would require some efforts on the part of exporters, he added.

Mr. Hashim felt that during the next decade the demand for leather and its products in the advanced countries would not slacken. At the same time, there may be some fresh additional demand in the world market for various leather items. He was of the firm view that the next decade would prove to be "a boom period for leather export trade from low-cost countries in the world".

It was, therefore, necessary to keep this important factor in mind while finalising export strategies for the leather sector, Mr. Hashim emphasised. He urged the commerce ministry to provide a single-window clearance for any problems that might be posed by a thrust sector like leather and the decisions handed down within a week. Procedural delays would thus be cut to the minimum and the exporters could save their valuable time, he elaborated.

The CLE chief urged the exporters to tackle the problem of pollution expeditiously. Meanwhile, the Footwear Design and Development Institute (FDDI), New Delhi, set up by the government, has been activated and a 30-month action plan has been drawn up. This is intended to be a premier centre of footwear development and design. Efforts are underway to organise industrial complexes for the leather industry in West Bengal, Punjab and Tamil Nadu.

TDA SUGGESTS CHANGES IN LEATHER EXPORT STRATEGY

The Trade Development Authority has suggested that India should change its strategy to improve export prospects of leather goods by concentrating on the production of high qual-

ity footwear. In a recent report, TDA says exporters should manufacture a complete range including sports footwear, children's footwear, ladies high fashion sandles and boots. While commending the growth of exports of leather goods in recent years, TDA, however, says "the world demand for footwear in the year 2000 AD is expected to be around 2,500 million pairs and we are seeking a share of only 200 million pairs". This is just 7.5% of the market — a target which is 'definitely attainable'.

The report entitled 'export prospects for leather goods and accessories including travel goods', says exporters must clearly understand the new strategy and technology being adopted by various countries in this field. Computer-aided design, new finishes on leather and computer-aided manufacturing are some of the areas being investigated by manufacturer-exporters all over the world. The country cannot lag behind in these fields if it is to effectively compete in the international market.

Germany, Italy and the US are important markets for leather goods and garments. The report says while certain countries in the Far East such as South Korea and Taiwan are India's major competitors, certain European countries are also its competitors. These include Spain, Portugal, Cyprus and Turkey. It is important to understand the strategies followed by these countries before India could formulate a relevant strategy for the leather goods industry.

It says developed countries such as the US are finding it difficult to produce leather articles competitively because of high cost of raw materials and labour as well as because of the tendency among the labour force to shrink in such low technology industries. India has been unable to provide the world market with products of same quality on a regular basis and thus its share in the world market is small.

The report says lack of good production planning, proper equipment, absence of trained workers, quality control and good managerial practices in regard to inventory control are the major factors hindering productivity. Shortage of raw hides and skins in the near future could lead to constraints in increasing export of leather goods. The Government must consider importing raw materials from the US and the Soviet Union who have offered to sell raw hides to India and increase the buy-back of the finished leather products. It is also necessary to consider curbing exports of finished leather either by levying a 7% export duty or fixing of floor prices or imposition of quotas.

At present, India produces a phenomenal 320 million pairs of footwear a year. A good 90% of it, however, is handicraft in cottage industry type units and is of lower quality and unfit for exports. About 12 million pairs were exported in 1986-87. A few large medium type units have modernised their technological infrastructure, and have been described as 'islands of modernity in an ocean of outmoded technology'. The report says with the adoption of new technologies and techniques the Indian leather goods industry can turn out ot be a major export earner.

Rs. 5,000-CR. LEATHER EXPORT TARGET SET

Encouraged by the present tempo of annual export growth of about 20%, the Council for Leather Exports has drawn up an ambitious plan for reaching the Rs. 5,000 crore mark in its exports by the end of the Eighth Plan period and Rs. 10,000 crores by the turn of the century.

In the terminal year of the Seventh Plan (1989-90), the export target is fixed at Rs. 2,000 crores, double the amount envisaged in the original Plan document. Exports had shot up to more than 175% in the first four years of the current Plan period. Since the Government is going to discontinue the export of semi-finished leather goods from next year, the Council has drawn up a Rs. 400-crore modernisation plan for the entire leather industry during the Eighth Plan period, according to Chairman of the Council, Mr. Mohammed M. Hashim.

To fund this massive scheme, the Council has proposed that a development fund be created. It has also asked the industry to set apart two per cent of its export earnings for boosting marketing. The Council was set up in June 1984 with its headquarters at Madras and regional offices located in all the major leather and leather goods' centres of Kanpur, Delhi, Calcutta and Bombay.

Stressing the need for speedy modernisation of the industry, Mr. Hashim said the age-old protection policy towards the traditional craftsmen did not hold good any more as the global demand was now for more high cost fashionable leather shoes and garments. He said the modernisation fund could be operated through agencies like the Industrial Development Bank of India so that the Indian tanner could produce a large variety of leather with consistent quality.

The Chairman said that Indian tanners had not changed basically since the late 1970s when they emerged as shoe upper leather manufacturers.

LEATHER SECTOR: TIE-UPS WITH SOUTH KOREA PLANNED

South Korea has been identified for joint ventures in the leather sector. A delegation from the Indian leather industry, led by the Council for Leather Exports (CLE) executive director, Mr. A. Sahasranaman, to South Korea, Japan and Austra-

lia, reported that there is a distinct possibility of setting up joint ventures with South Korea for manufacture of sports shoes and leather garments. The delegation noted that South Korea is showing increasing interest in importing shoe uppers and shoes for its own market due to the rising cost of domestic production. In fact, South Korea has reduced import duty on shoes to 15 per cent recently. The possibility of joint ventures with Korean companies assumes significance as the country accounts for a major share in world finished leather trade. The delegation was sent under the ITC/Sida project for the development of leather footwear industry in North Arcot district of Tamil Nadu.

Although export of shoe uppers to Japan is increasing, the delegation felt that quota on imports and high incidence of duty is a bottleneck. The delegation has recommended a dialogue with the Japanese government to reduce the duty incidence and exempt horachis (handmade Indian footwear) from the quota purview. In fact, horachis are in demand in all the three countries visited by the delegation.

The Australian market is also protected by the quota mechanism and high import duty. However, the delegation expressed optimism that the rising trend in Indian exports to Australia would continue as the country was slowly opening its doors to import. The delegation has urged the textile, footwear and clothing authority of Australia to exempt shoes and shoe uppers import from India made with Australian raw material from the purview of import duty.

To increase India's presence in the Australian market, efforts are on to organise buyer-seller meets in Melbourne and Sydney around February 1990. The meet is expected to receive assistance from the International Trade Development Centre. Special buyer-seller meets are also scheduled to be held in Seoul and Tokyo in November 1989. Besides the CLE executive director, the delegation included representatives from South East Footwear, Jameel Leathers and Farida Classics. The CLE chairman, Mr. M.M. Hashim, also accompanied the delegation.

Meanwhile, the Indian Leather Products Association (ILPA) pavilion at the recently concluded Offenbach International Leather Goods Fair has bagged on-the-spot orders worth Rs. 15 lakhs. Further export orders of Rs. 25 lakhs have also been confirmed. Expressing satisfaction over the debut of ILPA at Offenbach, association president R.K. Shrivastava hoped that participation in the fair would become an annual feature of ILPA's promotional activity.

CURBS MOOTED ON LEATHER MACHINERY IMPORT

The working group of the Planning Commission has suggested putting restrictions on import of leather machinery. According to a report prepared by the working group, the main reason why the indigenous leather manufacturing industry has not developed during the Seventh Plan is that most of the machinery was allowed to be imported under the open general licence at a concessional rate of duty.

In the face of competition with imported machinery, indigenous machinery manufacturers were not able to develop at competitive prices and meet the demand of leather and leather product manufacturing industries. The panel has hence suggested that even the foreign collaborations should be allowed with the existing manufacturers or those who are experienced in machine manufacturing. The collaborations of such existing manufacturers with foreign companies should be encouraged on equity, royalty and knowhow fee basis.

Moreover, there should be progressive review of the OGL list every year so that machinery allowed to be manufactured indigenously either in small sector or large sector should be given protection. Machinery manufacturers should be allowed to import prototype machinery for development indigenously as some of the machines are very costly. Prototype Development Centre or the Central Mechanical Engineering Research Institute should help indigenous machinery manufacturers by importing these machines and then passing the knowhow to small-scale manufacturers.

The Government has allowed only six units in the organised sector to manufacture machinery for leather sector. They are: Bata India, Binny Engineering, Guest Keen Williams, Vulcan Laval, McNeil Magor and Prototype Development and Training Centre. Of these, only Bata is for shoe manufacture and Prototype Development Centre for finished leather and shoe manufacturing.

The working group has suggested that machines which are common for different style/design be encouraged for indigenous manufacture. To meet the additional demand both of domestic and international market, an investment of around Rs. 1,000 crores would be required to be made in plant and machinery by way of creating new capacities and additional Rs. 6,639 crores in modernisation or replacement of 20 per cent of the existing capacity.

This is based on the capacities that would be required to be created by 1994-95. These are finished leather 240 million square feet, leather footwear 118 million pairs, shoe uppers 2.4 million pairs, leather garments 1.25 million pieces and leather goods 29 million pieces. Based on these figures the maximum investment in plant and machinery would go in finished leather which would swallow Rs. 1,018 crores followed by footwear Rs. 472 crores, shoe uppers Rs. 32 crores, garments Rs. 3.06 crores and leather goods Rs. 14.30 crores.

The report said this would also require a whole lot of chemicals as well. It has hence cautioned that petrochemicals industry be geared up for supply of raw materials for production of the essential chemicals required by the leather industry. As bulk of these raw materials are imported, the group has suggested that duty be reduced for export production.

While restricting import of leather machinery and boosting indigenous manufacturing, the group has suggested that quality should not be compromised. Simultaneously, the concessional duty on complete machinery should also be reviewed so as to help the indigenous manufacturers to grow to the economic scales of production. It has pointed out that in the short run dependence on imported machinery was unavoidable to achieve export targets. In the long run India will have to develop manufacturing capabilities.

The Government should recognise the fact that leather machinery is not being manufactured in the country not for want of technology, but clearly for lack of support as the technology required is not as advanced compared to other kinds of engineering goods manufactured in the country.

KANPUR LEATHER INDUSTRY IN CRISIS

The Kanpur leather industry, famous across the country for its products, is now facing a crisis because of stiff competition from other states and the hike in the price of raw materials. Leather industry sources said footwear manufacturers were the most affected in the industry following the emergence of a cottage industry that employs 50,000 people.

The sources said that while the price of leather had gone up by 40 to 50 per cent during the past two years the cost of raw materials such as rubber sheets, colours, nails and labour charges had also gone up considerably. The industry has also had to pay 8% sales tax and 10% surcharge on multi-points tax. The sources claimed that several states had exempted the tax on chappals valued at up to Rs. 50 but in Uttar Pradesh chappals of all costs were taxable.

The sources said that besides the increase in cost of production, chappal manufacturers faced touch competition from states like Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and West Bengal. The sources blamed the goverment for the lack of fine leather in the local market and said the leather available in local markets was too expensive. They said that there had been a 50 to 75 per cent rise in leather prices during the past two years. The sources said because of all these problems only Rs. 5 to 10 lakh worth of chappals had been sold as against the daily sale of Rs. 50 lakhs to one crore in the past. Shoe manufacturers also face the same problems because of the increase in the import of synthetic leather and foreign shoes.

LEATHER ABSTRACTS

INDONESIA

Livestock holdings ('000 head)

	1979-81	1984	1985	1986
Cattle & calf	6505	6543	6480	6465
Buffaloes	2495	2743	2838	2936
Pigs	3234	5112	5371	5643
Sheep & lamb	4124	4790	4940	5193
Goats	8135	11947	12117	12289

Slaughterings ('000 head)

Cattle & calf	1002	1064	1132	1200 a
Buffaloes	277	301	304	306 b
Pigs	2212	2978	3330	3725 b
Sheep & lamb	2273	3500	2500	2450 a
Goats	4402	4830	4950	5070 b

Hide & skin production (metric tonnes)

Cattle & Buffaloes	32528	34727	36508	38261 a
Sheep & lamb	4545	7000	5000	4900 a
Goat	8804	9660	9900	10140 a

a - estimate b - unofficial

Exports of hides, skins and leather from Indonesia 1986

	wt/kg
Cattle hides	2,866,000
Goat & kid skins	1,729,000
Sheep & lamb (without wool)	490,000
Lizard skins	33,000
Crocodile & alligator skins	4,000
Snake skins	108,000
Calf leather (dressed)	119,000
Buffaloe leather (dressed)	6,000
Other bovine leather (dressed)	181,000
Sheep & lamb (dressed)	316,000
Goat & kid leather (dressed)	120,000
Snake & crocodile leather (dressed)	47,000
Other reptile leather (undressed)	900
Other reptile leather (dressed)	18,000
Chamois leather	(dressed)1,300

World Leather 2, (3), 1989

ARGENTINA LEATHER INDUSTRY

Evolution of Argentine cattle herds, rate and total slaughter

Year	Cattle herds	Slaughter	Slaughter rate
1979	59.2	15.6	26.4
1980	55.8	14.0	25.0
1981	54.0	15.2	28.1
1982	53.0	12.4	23.3
1983	53.5	11.4	21.3
1984	52.0	12.0	23.0
1985	51.0	13.7	26.8
1986	49.0	13.6	27.7
1987	48.0	12.3	25.6
1988	50.0	12.0	24.0
1989	51.0	12.0	23.5

Destination of Argentina leather exports in 1988

Country	% of total exports
USA	34
Canada	10
Brazil	3
Soviet Union	5
Poland	4
China	1
Holland	6
Korea	4
Hungary	1
Czechoslovakia	2
Uruguay	4
Germany	3.5
Others	18.5

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MARKET INFORMATION

Hydro Spurts, Dyes Intermediates Up

Strong seasonal demand and tight supplies pushed price of hydro up by Rs. 6 to Rs. 44 per kg. Acrylamide eased further to Rs. 77 per kg. Rangolite moved further up for imported materials. Strong demand for dyes intermediates urged by good exports of dyes pushed prices up. Small intermediate manufacturers are also operating with high efficiency to service increased demand. In particular C. Acid (imported) went up by Rs. 35 to Rs. 210 per kg. J. Acid (urea) went up by Rs. 20 to Rs. 410 per kg. Chicago acid moved up by Rs. 15 to Rs. 345 per kg. Para amino acetanilide moved up by Rs. 25 to Rs. 195 per kg.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on September 19, 1989)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	3.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	77.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	15.00
Borax (Powder)	15.25
Boric acid (Tech)	28.00
Bisphenol-A	82.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	280.00
Cresylic acid	52.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	24.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	115.00
Hydro	44+ST

Hyflosupercell	21.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	29.00
Magnesium chloride (Crystal)	2.25+ST
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	38.00
Mercury (34.5 Kgs)	12,000.00
Nickel chloride	110.00
Oxalic acid (Resale)	22.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	30.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	26+ST
Phthalic anhydride 36% (Resale)	25.50
Pentaerythritol (Resale)	45.00
Paraffin wax	18+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	80+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	680.00
Sodium chlorite 80% (Spain)	88.00
Soda Ash (Tata)	5.00
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	250+ST
Titanium Dioxide (Anatase)	115+ST
Titanium Dioxide (Rutile – RCR_2)	150.00
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	77+ST
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	52.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	31.50
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	70.00
Benzoate Plasticiser	62.00
Butyl acrylate	78+ST
Butyl stearate	50.00
Butanol	35+ST
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	78.00
Chloroform	31.00
Carbon Tetrachloride	19.50
Cellosolve	64+ST
Cyclohexanone	56+ST
Cyclohexanol	58+ST
Diacetone (Resale)	34.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG)	43.00
Dioctyl Phthalate	45.00
Diallyl Phthalate	56.00
Dimethyl Phthalate	28.00
Dioctyl Adipate	52.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	26.00
Dimethylamine 50%	30.00
Ethyl Acetate	21.00
Ethyl Acrylate	65.00
Ethylene Dichloride	14.50
Ethylene Glycol	45+ST
Formic Acid (Imp.)	25.00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53.00
Hydrogen Peroxide 50% (Resale)	27.50
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	30.00
Monoethanolamine (Resale)	65.00
Melamine	65.00
Methyl Ethyl Ketone	45.00
Methyl Isobutyl Ketone	58.00
Methyl Acrylate	60.00
Methyl Dichloride (Resale)	26.00

Carbitol	68+ST
Meta Cresol	45.00
Nitrobenzene	30.50
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	38.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	63.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	36.00
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	65.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	12.00
Methanol	10.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	21.00
Xylene	22.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	215.00
Anthraquinone	130.00
Anthranilic Acid	78.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	98.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid IRS	345.00
Coach Acid	60.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	135.00
2,4- DNCB	31.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	72.00
Diethyl Aniline	180.00
Diamino stilbene disulphonic acid	160.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	125.00
G. Salt	78.00
Isophthalic Acid	45.00
J. Acid	365.00
J. Acid Urea	410.00
K. Acid	127.00
MPDS (German)	190.00
MNA	150.00
Meta Ureido Aniline	235.00
MPD (Local)	220.00
MPD (Japan)	250.00
Naphthenic Acid	40.00
N-Methyl J. Acid	620.00
N-Methyl Aniline	160.00
Naphthalene (Refined)	20.50
Ortho Anisidine (OA) (Imp.)	110.00
Ortho Dichloro Benzene (ODCB)	16.00
OT Base	120.00
Para Dichloro Benzene (PDCB)	27.00
Para Anisidine (PA local)	155.00
PNA	112.00
Para Cresidine (Imp.)	400.00
Para Amino Azo Benzene (India)	190.00
PNCB	55.00
Para Amino Acetanilide	195.00
1-Phenyl 3-Methyl 5-Pyrazolone	165.00
Phenyl J. Acid	375.00
Para Amino Benzoic Acid	135.00
PT Base	155.00
Rhoduline Acid	530.00
Resist Salt 80%	34.00
Resorcinol	210.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	52.00
Sulpho Tobias Acid	165.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	165.00
Metanilic Acid	44.00
MTD	125.00

Bombay Dyes Market

(Prices as on September 19, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Sun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60

STR	369.00
SPH	336.05
SE	236.00
SEL	249.95
SLB	2002.35
SBT	2459.45
SWG	143.00
SSG	538.65
SSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow MGR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M3R	244.70
rill. Orange H2R	303.80
rill. Red H7B	157.95
rill. Orange M2R	313.15
rill. Red H8B	213.55
rill. Scarlet H RN	245.05
upra Red H-3BP	179.80
rill. Red H-F3B	243.45
rill. Magenta HB	182.00
rill. Red M 5B	160.05
ill. Red M 8B	218.35
ill. Pink MB	137.10
ill. Magenta MB	163.65
ill. Purple H-3R	219.55
ll. Purple H-7R	175.40
vy Blue H 3R	333.75
ll. Blue H-GR	406.40
ll. Blue H5G	207.95
e H 5RX	286.20
l. Blue H 7G	213.95
l. Blue H 7RX	358.15
quoise HA	265.05
ora Blue H-3RP	595.30
ora Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: SEPT. 25, (NNS) Due to fall in import from France as well as negligible stock in the market, tartaric acid (France) jumped up sharply by Rs. 2,000 at Rs. 14,000 per 50 kg in the Delhi chemical market during last week, reports NNS. Trishul Marka tartaric acid looked up by Rs. 100 at Rs. 3,200 per 15 kg.

Chatkolite and sufolite flared up from Rs. 76 to Rs. 85 and Rs. 84 per kg on account of poor import from China and Germany but later on in the wake of fresh supply it reacted downward and closed at Rs. 80 each per kg, yet showing a rise of Rs. 4. Demand was good by gur khandsari manufacturers. Titanium dioxide anatase looked up by Rs. 7 at Rs. 118 on scanty supply. As a result of acute shortage of stock in the market, titanium dioxide RC-822 and RCR-2 went up sharply by Rs. 8 at Rs. 158 each per kg. K brand titanium dioxide moved up from Rs. 102 to Rs. 105 due to good demand from paint and plastic units.

In the wake of dwindling supply and keen demand from the detergent cake and power manufacturers, acid slurry soft and hard moved up by Rs. 2/3 at Rs. 28 and Rs. 38 per kg respectively. In anticipation of hike in its prices by manufacturers and brisk offtake from gur and khandsari manufacturers, sodium hydro sulphite kalali rose from Rs. 36.50 to Rs. 37.50 per kg. Demosha hydro also hardened from Rs. 36 to Rs. 36.50 per kg. Hydro Tamilnadu, however, was quoted cheaper by 25 paise at Rs. 36.25 per kg.

Following tight supply and increased demand from the candle manufacturers, paraffin wax registered a gain of Rs. 35 at Rs. 900 per 50 kg. Slack wax flared up by Rs. 100 at Rs. 9,800 per tonne due to tight stock position. Mercury, on the other hand slipped by Rs. 100 at Rs. 11,400 per flask on better offerings. Citric acid thin drifted lower by Rs. 25 at Rs. 2,150 on account of increased offerings of imported goods. Menthol flake medium and bold dropped by Rs. 20/25 at Rs. 300, Rs. 325 and Rs. 350 per kg. On account of dehoarding tendency by the stockists of U.P. Menthol flake Sept. and Diwali delivery also drifted lower by Rs. 15 each at Rs. 310 and Rs. 325. Sodium sulphate DCM declined by Rs. 50 at Rs. 3,350/3,550 per tonne due to lack of enquiry. Sodium sulphate rayon ruled quiet at its previous level. No variation was recorded in dyes and colours.

(DELHI MARKET RATES AS ON SEPTEMBER 15, 1989)

Ammonia Bicarb (Per 25 Kg.)	150.00
Mercury (Per flask)	11,400.00
Soda ash (Per bag)	335/355.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	565/570.00
Citric acid (Per 50 Kg.)	2,150/2,500.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl (Per 25 Kg.)	95.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	98.00
Sodium Bicarbonate (50 Kg.)	290/300.00
Sodium Hydrosulphite (Per Kg.)	34.00/37.50
Rangolite (Per Kg.)	80.00/100.00
Boric acid Technical (Per 50 Kg.)	1,425.00
Paraffin Wax (Per 50 Kg.)	900.00
Tartaric Acid (Per 50 Kg.)	14,000.00
Borax Granular (Per 50 Kg.)	700.00
Borax Crystal (Per 50 Kg.)	710.00
Sodium Nitrite (Per 50 Kg.)	700/760.00
Sodium Nitrate (Per 50 Kg.)	425.00
Camphor Thal (Per Kg.)	110.00
Camphor Powder (Per Kg.)	102.00
Menthol Bold (Per Kg.)	350.00
Menthol Medium (Per Kg.)	325.00
Menthol Flake (Per Kg.)	300.00
Glycerine (Per Kg.)	55/58.00
Sodium Silicate (Per quintal)	275/350.00
Hexamine (Per Kg.)	33.50
Acetic Acid Glacial (Per Kg.)	15.00
Copper Sulphate (Per quintal)	2,350/2,700
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	27.50
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28.00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,025.00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	490.00
Titanium Dioxide Anatase (Per Kg.)	118.00
Titanium Dioxide RC-822 (Per Kg.)	158.00
Titanium Dioxide K-Brand (Per Kg.)	105.00
Titanium Dioxide RCR-2 (Per Kg.)	158.00
Zinc Oxide (Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.25
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,250/3,550.00
Naphthalene Balls (Per 50 Kg.)	1,325.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/201.65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	265/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.)
Black E. Conc.	110/176.90
Diazo Black B.T.	105/147.55
Green B	90/140.55
Blue 2-B	60/101.40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.05
Basic Auramine	55/110.00
Basic Rhodamine	300/425.00
Basic Methylene Blue	100/180.00
Basic Violet	150/180.00
Basic Malachite Green	150/165.00
Acid Orange	75/111.00
Congo Red H/C	75/120.00

Madras Market

Markets have not been much active due to lack of demand from consumers but for some specific item. Sales of solvents have been good and brisk. Considerable quantities of imported xylene were offered from upcountry markets. Demand for toluene has been good but supplies were inadequate. Acetone was in good demand with prices registering further increase from old levels. Formic acid prices fell further due to availability of large quantities of imported stocks. Similarly prices of cyclohexanone fell below the indigenous manufacturers' prices even though there were not much of imports in the recent times. Prices of non-ionics registered increase in prices due to reported shortage of ethylene oxide on account of IPCL shutdown.

(MADRAS MARKET RATES AS ON SEPTEMBER 16, 1989)

Acetic Acid Glacial (per kg)	16.50
Aluminium Sulphate Iron free (per MT)	3,500.00
Ammonium Bicarbonate (per 25 kgs)	150.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	30.00
Barium Carbonate (per kg)	6.25
Barium Chloride (per kg)	5.50
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	240.00
Borax (per 50 kgs)	685.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	12,200.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	12,200.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,750.00
Calcium Carbonate (Activated) (per MT)	5,750.00
Calcium Carbonate (Precipitated) (per MT)	4,750.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	120.00
Pure Para Cresol 96% (per kg)	80.00
Meta Para Cresol 42% (per kg)	49.50
Formic Acid (per kg)	25.50
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine (per kg)	49.00
Hydrosulphite of Soda (TCPL) (per kg)	37.00
Hydrosulphite of Soda (IDI) (per kg)	40.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	29.50
Hyflo Supercell (per kg)	20.00
Hydrogen Peroxide (per kg)	29.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	19.50
Magnesium Chloride (per kg)	3.5
Maleic Anhydride (per kg)	39.0
Menthol Crystals (per kg)	390.0
Oxalic Acid (per kg)	24.0
Paraffin Wax (per kg)	19.0
Potassium Bichromate (per kg)	36.0
Phosphoric Acid (per kg)	22.0
Polyvinyl Alcohol powder (per kg)	125.0
Pentaerythritol (per kg)	50.0
Phthalic Anhydride (per kg)	29.0
Soda Ash (TAC) (per 75 kgs)	385.0
Soda Ash (TATA) (per 75 kgs)	385.0
Sodium Bicarbonate (TATA) (per 50 kgs)	375.0
Sodium Silicate (per MT)	3,500.0
Sodium Bichromate (per kg)	28.0
Sodium Nitrate (per kg)	8.0
Sodium Nitrite (per kg)	15.0
Sodium Sulphide Flakes (per kg)	12.0
Sodium Bisulphite (per kg)	4.5
Sodium Alginate (per kg)	215.0
Sodium Acetate (per kg)	7.0
Sodium Sulphate (Anhydrous) (per kg)	3.0
Titanium Dioxide (Anatase) (per kg)	105.0
Titanium Dioxide (Rutile) (per kg)	120.0
Trisodium Phosphate (per kg)	12.0
Urea (Technical) (per kg)	3.0
Zinc Oxide (per kg)	54.0
Zinc Chloride Powder (per kg)	12.0
Zinc Sulphate (per kg)	6.5

SOLVENTS

Acetone -- HOCL (per kg)	22.0
Butanol (per kg)	36.0
Butyl Acetate (per kg)	44.0
Benzene (per lit)	17.0
Cellosolve (per kg)	50.0
Carbon Tetra Chloride (per kg)	23.0
Chloroform (per kg)	28.0
Diacetone Alcohol (per kg)	29.5
Diethylene Glycol (per kg)	47.0
Dichloroethane (per kg)	17.0
Di-octyl Phthalate (per kg)	50.0
Di-N-butyl Phthalate (per kg)	50.0
Ethyl Acetate (per kg)	22.0
Isopropyl Alcohol (per kg)	30.0
Methanol (per kg)	10.0
Methylene Chloride (per kg)	23.0
Methyl Ethyl Ketone (per kg)	40.0
Methyl Isobutyl Ketone (per kg)	39.0
Phenol (per kg)	34.0
Sorbitol (per kg)	15.0
Triethanolamine (per kg)	61.0
Trichloroethylene (per kg)	25.0
1-1-1 Trichloroethane (per kg)	27.0
Turpentine (per lit)	16.5
Toluene (per lit)	22.0
Xylene (per lit)	22.0

International Bulk Chemical Prices

Spot Prices are as on August 30, 1989

Naphtha prices remained stable at $155-157/ton cif NWE. Ethylene prices moved upto $310-325/ton cif following tightening of supplies. Propylene began to firm up, with spot prices for chemical grade being quoted at DM710-730/ton cif NWE and polymer grade at DM730-760/ton cif NWE. Butadiene prices kept rising on account of tight supplies and was being quoted at $400-405/ton fob NWE. Benzene remained steady at $325-335/ton fob Rotterdam. Strong demand from gasoline blenders lifted toluene prices to $245-250/ton fob. Paraxylene recovered to $650-660/ton. Orthoxylene prices rose to $325-335/ton fob Rotterdam on account of sustained demand from European phthalic anhydride producers. Xylene remained static. Styrene prices which had peaked at $680/ton cif NWE for T1 material has slipped to $650-670/ton cif NWE following restart of Atochems plant in France. Methanol continued to fall with T1 material at $60-65/ton cif NWE and T2 quoted at DM140-145 fob Rotterdam.

Product	European Spot price range $/ton	US price range $/ton
Ethylene	310-325 (cif)	n.a
Propylene (100% basis)	366-392 (cif)	n.a.
Butadiene	400-405 (fob)	551-595 (spot)
Benzene	325-335 (fob)	299-300 (spot)
Toluene	245-250 (fob)	234-237 (spot)
Xylenes (virgin)	310-315 (fob)	264-266 (spot)
(solvent)	305-310 (fob)	n.a.
Styrene	700-710 (T2)(fob) 650-670 (T1) (cif)	573-617 (spot)
Paraxylene	650-660 (fob)	n.a.
Orthoxylene	325-335 (fob)	n.a.
Ammonia	98-102 (c&f)	n.a.
Methanol	72- 75 (T2)(fob) 60- 65 (T1)(cif)	158-160 (fob)
Naphtha	155-157 (cif)	n.a.

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
7/9 0/9	CMB Equity/ CMB Ebony (Nhava Sheva)	C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal; Toronto; Halifax. (Carting at CFS).	29/9 2/10
0/9	Hoegh Dene	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5 & B.P. Extn.).	30/9
4/9	Mahsuri	Killick	S. American Ports. (Carting at 178/180 Cotton Depot).	28/9
3/9	Waterschout	Merzario	Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville; Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry; Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).	30/9
9 0/9	CMB Equity/ CMB Ebony (Nhava Sheva)	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Louanda; Monrovia; Tema; Via Antwerp. (Carting at CFS).	29/9 2/10

(1)	(2)	(3)	(4)	(5)
23/9	Waterschout (Dut)	Samrat/ Hindustan/ Merzario	Felixstowe; Hamburg; Rotterdam; also London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester; Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all destinations in U.K. Benelux Germany; Italy; France; Switzerland & Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at M.O.D. No. 1 for Samrat & Hindustan).	30/9
30/9	Oyster Bay	Tata Tea	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	3/10
27/9	CMB Equity	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona;	29/9
30/9	CMB Ebony (Nhava Sheva)		Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in U.K.; Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malma; Aarhus; Helsinki. (Carting at CFS).	2/10
25/9	A.S. Okan (Tur)	U.L.A.	Jeddah; Turkish ports.	4/10
30/9	Tibor Szamuely (Rus)(Voy-102 W/B)	Transocean	Odessa; Ismail; Reni (U.S.S.R.); Russe Bulgaria; Bupadest (Hungary); Linz; Vienna (Austria); Bratislava (Czechoslovakia); Deggendorff; Regenborg (West Germany); (All ports on River Danube). Carting at N/O-PD & G-PD).	1/10
2/10	Kalidas (Nhava Sheva)	S.C.I.	Chittagong	4/10
23/9	Lyudmila Stal	Transocean	Kobe; Nagoya; Yokohama.	2/10
29/9	Kamnik (Yug)	Depe	Hongkong; Keelung; Kaohsiung; Kobe; Yokohama; Busan.	5/10
2/10	Kalidas (Nhava Sheva)	S.C.I.	Singapore and other Far East ports.	4/10
24/9	Mahsuri (Sing) (V-0558)	I.M.E./	Sydney; Melbourne; Adelaide; Freemantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3 for I.M.E.).	28/9
		Killick/ Tata Tea	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon P.; Launceston; Burnie; P. Chalmers; Lyttelton; Christchurch; Dunedin; New Plymouth; Auckland; Wellington; Napier. Also western Samoa; Papua; New Guinea; Solomon Island; American Samoa; Tonga; New Calidonia; Rabaul; P. Villa. (Carting at M-178/180 Cotton Depot for Killick) (Carting at Timber Pond No. 4 for T. Tea).	
2/10	Kalidas (Nhava Sheva)	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney.	4/10
27/9	CMB Equity (NS)	C.M.B.	Dubai; Abu Dhabi; Bahrain; Kuwait; Dammam; Doha. (Crtg. at CFS).	29/9
Stream	Satguru	H.S.A.	Dubai; Sharjah.	28/9
20/9	Sira Trader (Nor)	I.L.S.A.	Dubai.	28/9
30/9	Oyster Bay (V-4044) (Br)	Arebee/	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Carting at M-Jetha C.D.).	3/10
		Tata Tea	Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa. (Carting at Timber Pond No. 4).	
30/9	CMB Ebony (Nhava Sheva)	C.M.B.	Dar Es Salaam; Mombasa (Direct); Nacala; Tanga; Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in East Africa. (Carting at CFS).	2/10
23/9	Jala Mudra (Ind)	S.C.I.	P. Louis. (Carting at Timber Pond No. 1).	28/9

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
29/9	Bhavabhuti	S.C.I.	U.K. Cont.
30/9	Jordan	S.C.I.	U.K. Cont.
2/10	Kalidas (Nhava Sheva)	S.C.I.	Australia
28/9	Pembroke	S.C.I.	Japan/Far East
30/9	Tibor Szamuely (V-102W/B)	Transocean	Russia & E. Europe
28/9	Tilia	U.L.A.	Gulf
1/10	Vishva Karuna	S.C.I.	Constanza

Materials Imported

BOMBAY
(From 18.5.89 to 22.5.89)
(Contd. from previous issue)

METHYL METHACRYLATE MONOMER: From USA: Snerjon Technics Co. Ltd., 14,043 Kgs., Rs. 3,41,195.

METHYL SALICYLATE: From UK: Quest International India Ltd., 3,420 Kgs., Rs. 2,35,030.

MOLYBDENUM DISULPHIDE: From UK: Archana Corporation, 200 Kgs., Rs. 31,215.

MOLYBDENUM TRIOXIDE REFINED: From UK: Anupam Colours & Chemicals Inds., 500 Kgs., Rs. 64,518.

MONO ISOPROPYLAMINE: From FRG: Cipla Ltd., 1,560 Kgs., Rs. 40,594.

PARANITRO CHLOROBENZENE: From FRG: Bayer (India) Ltd., 36,000 Kgs., Rs. 8,00,796.

PARAFORMALDEHYDE: From Spain: Dr. Beck & Co. (I) Ltd., 18,000 Kgs., Rs. 1,64,284.

PARAXYLENE: From Italy: The Bombay Dyeing & Mfg. Co., 1,820.569 MTs., Rs. 2,28,94,902.

PIVALOYL CHLORIDE: From France: SKS Pharmaceuticals India Pvt. Ltd., 1,080 Kgs., Rs. 72,182.

POTASSIUM CHLORIDE: From Canada: Atul Products Ltd., 540 MTs., Rs. 16,31,121.

PROPYLENE GLYCOL: From Japan: Asian Paints India Ltd., 16,170 Kgs., Rs. 3,33,332.

PROPYLENE GLYCOL USP: From USA: Asia Trade Enterprises, 34,400 Kgs., Rs. 7,11,836.

SILICON METAL: From Singapore: Nikhil Alloy Steels Pvt. Ltd., 40,262 Kgs., Rs. 6,98,714.

STANNOUS OCTOATE: From FRG: Dinesh Jain & Bros., 500 Kgs., Rs. 73,959.

TARTARIC ACID: From Spain: Pfizer Limited, 2,000 Kgs., Rs. 1,16,289.

TETRAHYDROFURAN: From FRG: Rallis India Ltd., 2,184 Kgs., Rs. 96,228.

THIOGLYCOLLIC ACID: From FRG: Jayant Vitamins Ltd., 480 Kgs., Rs. 26,592.

TITANIUM DIOXIDE: From FRG: Inarco Ltd., 10,000 Kgs., Rs. 4,48,478; From USA: Asian Paints India Ltd., 60,000 Kgs., Rs. 22,18,781.

TOLUENE DI ISOCYANATE: From France: Bharat Petrofoam Co. Pvt. Ltd., 19 MTs., Rs. 6,42,817.

PARA TOLUIDINE META SULFONIC ACID: From UK: PDI Chemicals Ltd., 2,974.95 Kgs., Rs. 1,80,946.

TRIARYL PHOSPHATE: From France: Bharat Heavy Electricals Ltd., 11,420.720 Kgs., Rs. 5,54,393.

TRIETHYL ORTHOFORMATE: From Japan: Cipla Ltd., 540 Kgs., Rs. 81,914.

TRIETHYLENE GLYCOL: From Japan: Century Enka Limited, 2,250 Kgs., Rs. 69,042.

TRIETHYL PHOSPHITE: From FRG: Colour Chem Ltd., 3,800 Kgs., Rs. 2,07,334.

TRIMETHYLENE GLYCOL: From FRG: May & Baker India Ltd., 3,080 Kgs., Rs. 95,659.

TRIMETHYL PHOSPHITE MIN 90%: From USA: National Insecticides, 31,026.96 Kgs., Rs. 10,74,102.

TRIPHENYL PHOSPHINE: From FRG: Ranbaxy Laboratories Ltd., 2,000 Kgs., Rs. 3,05,523.

XYLENE (MIXED): From FRG: Reliance Inds. Ltd., 2,022.806 MTs., Rs. 1,69,55,781.

PLASTIC MATERIALS IMPORTED
BOMBAY
(From 23.5.89 to 28.5.89)

ACRYLAMIDE: From Japan: N.M. Chemicals, 15,000 Kgs., Rs.3,54,061.

1 BROMO 3 CHLORO PROPANE: From Netherlands: Cipla Ltd., 250 Kgs., Rs. 22,335.

BUTYL ACRYLATE: From China: Omega International, 52,120 Kgs., Rs. 9,61,062; From Japan: BASF India Ltd., 14,400 Kgs., Rs. 4,26,006.

BUTYL METHACRYLATE: From Japan: Shreenathjee Inds., 3,060 Kgs., Rs. 1,20,382.

HDPE: From Czechoslovakia: D. Jamnadas & Co., 25 MTs., Rs. 2,89,026; Kalpesh Plastic Inds., 37.5 MTs., Rs. 4,33,539; From Japan: Pan Asia International Pvt. Ltd., 20 MTs., Rs. 3,52,488; Lami Fab & Papers Pvt. Ltd., 50 MTs., Rs. 8,85,200; From Saudi Arabia: Prince Plastics, 34,300 Kgs., Rs. 5,39,746; Shree Krishna Polychem Pvt. Ltd., 54 MTs., Rs. 8,96,599.

LDPE: From Belgium: Xpro India, 15.750 MTs., Rs. 3,22,914; From UAE: Xpro India, 33,000 Kgs., Rs. 6,28,340.

POLYPROPYLENE: From Bulgaria: Shankar Packagings, 48.500 MTs., Rs. 8,47,244; From FRG: Heli Plastics Ltd., 12,500 Kgs., Rs. 4,15,402; From Italy: Blow Plast Ltd., 83.15 MTs., Rs. 2,94,848; Chloride Inds. Ltd., 30 MTs., Rs. 5,90,102; VIP Inds. Ltd., 60 MTs., Rs. 11,79,040; From Singapore: Narendra Poly Plast, 31.440 MTs., Rs. 5,26,842; From USA: Pan Asia International Private Limited., 31.440 MTs., Rs. 4,60,256; Paharpur Cooling Towers Ltd., 16.5 MTs., Rs. 2,47,360; Paharpur Plastics, 16.5 MTs., Rs. 2,47,360.

POLYSTYRENE RESIN: From Korea: Auroplast Ltd., 17,000 Kgs., Rs. 3,82,002.

MONOCHLORO ACETIC ACID: From FRG: Chandra Pharmaceuticals Ltd., 33,000 Kgs., Rs. 6,11,252.

NEO PENTYL GLYCOL: From USA: Bakelite Hylam Ltd., 3,402 Kgs., Rs. 85,913.

OXALIC ACID: From Japan: Plant Organics Ltd., 17,500 Kgs., Rs. 3,79,537.

PERCHLORO ETHYLENE: From Netherlands: Triton Valves Ltd., 10,075 Kgs., Rs. 1,09,252.

PHOSPHORIC ACID: From USA: Madras Fertilisers Ltd., 22,39,708 Kgs., Rs. 1,61,52,354.

POTASSIUM FERRO CYANIDE: From FRG: Deccan Drugs Ltd., 9,000 Kgs., Rs. 1,70,302.

POTASSIUM GOLD CYANIDE: From FRG: Reed Relays and Electronics, 1,000 Kgs., Rs. 1,54,480.

PROPYLENE GLYCOL USP: From Singapore: Arvind Dyechem, 5,600 Kgs., Rs. 1,82,496; From USA: Aravind Dyechem, 8.6 MTs., Rs. 1,32,496.

SILICON: From France: India Pistons Ltd., 18 MTs., Rs. 4,59,449.

SILICON CARBIDE: From Norway: Carborundum Universal Ltd., 42,000 Kgs., Rs. 8,86,368.

SILICON METAL: From France: India Pistons Ltd., 18 MTs., Rs. 4,59,449.

SODIUM: From Japan: Priya Chemicals, 8.45 MTs., Rs. 3,10,136.

SULPHUR: From Kuwait: M.M.T.C., 6,418 MTs., Rs. 1,43,05,426.

SULPHUR INSOLUBLE: From FRG: MRF Ltd., 40,500 Kgs., Rs. 12,73,902.

TETRAHYDROFURAN: From USA: Nova Magnetics, 28,392 Kgs., Rs. 12,22,289.

TITANIUM DIOXIDE RUTILE: From Japan: Addisons Paints & Chemicals Ltd., 34.5 MTs., Rs. 15,03,127.

VANILLIN: From France: Bush Boake Allen (I) Ltd., 2,000 Kgs., Rs. 5,30,518.

ZINC BACITRACIN FEED GRADE: From Belgium: Mysore Feeds Ltd., 1,000 Kgs., Rs. 37,229.

DRUG MATERIALS IMPORTED MADRAS
(From 24.7.89 to 31.7.89)

AMPICILLIN SODIUM STERILE: From Italy: Armour Pharmaceuticals Pvt. Ltd., 100 Kgs., Rs. 1,72,436.

D-CALCIUM PANTOTHENATE: From Japan: Remidex Pharma Ltd., 500 Kgs., Rs. 1,11,998.

CHLOROFORM: From France: Neuland Laboratories Ltd., 32,480 Kgs., Rs. 3,73,886.

PANCREATIN I.P.: From FRG: TTK Pharma Pvt. Ltd., 200 Kgs., Rs. 1,50,929.

PENTAZOCINE BASE BP/IP: From Italy: South India Research Institute, 2 Kgs., Rs. 54,989.

TETRAMISOLE HCL BP: From China: Muthu Meena Agencies, 400 Kgs., Rs. 1,48,136.

DYE MATERIALS IMPORTED MADRAS
(From 24.7.89 to 31.7.89)

DYESTUFFS: From Sweden: C.A. Akthar & Company, 50 Kgs., Rs. 14,269; From Switzerland: Quinn India Ltd., 50 Kgs., Rs. 25,049.

SAVINYL YELLOW: From Switzerland: Quinn India Ltd., 50 Kgs., Rs. 25,049.

SYNTHETIC ORGANIC DYESTUFF: From China: H.I. Rafeeque Ameen & Company, 10,000 Kgs., Rs. 5,00,490.

PLASTIC MATERIALS IMPORTED MADRAS (From 24.7.89 to 31.7.89)

EPOXY RESIN: From Japan: ECP Ltd., 16 Nos., Rs. 33,169; ECP Ltd., 3,600 Kgs., Rs. 2,98,520; From Korea: Suchitra Components Ltd., 30 Kgs., Rs. 1,376.

HDPE: From Japan: Alagiri Polypack Pvt. Ltd., 25,000 Kgs., Rs. 4,34,419; Reliance Plastics Pvt. Ltd., 33 MTs., Rs. 5,49,622; From Saudi Arabia: Himol Inds., 17,150 Kgs., Rs. 2,93,072; From Singapore: Integrated Exports, 25,500 Kgs., Rs. 3,17,504; International Exports, 8,500 Kgs., Rs. 1,05,803; Rabbani Exports, 15.250 MTs., Rs. 2,02,709; Shameena Enterprises, 52.102 Kgs., Rs. 8,72,498; From USA: Lalith Polypacks Pvt Ltd., 16 MTs., Rs. 2,26,394.

HDPE GRANULES: From Japan: S.S. Laminates Pvt. Ltd., 33 MTs., Rs. 5,05,038.

PVC RESIN: From Austria: Amco Batteries Ltd., 18 MTs., Rs. 3,93,240; From Yugoslavia: Maruthi Shoes Allies & Inds., 30,000 Kgs., Rs. 6,03,584.

MATERIALS IMPORTED MADRAS (From 1.8.89 to 5.8.89)

D-ALPHA PHENYL GLYCINE: From China: Eskayef Ltd., 6,300 Kgs., Rs. 16,09,219.

ALUMINA: From Japan: Elecra Substrates Ltd., 18,000 Kgs., Rs. 3,79,073.

ALUMINIUM OXIDE BROWN: From Hong Kong: Carborundum Universal Ltd., 20,500 Kgs., Rs. 2,75,756.

AROMATIC CHEMICALS: From China: Bharat Industrial Corpn., 5,000 Kgs., Rs. 1,00,491; The Mysore State Agarbathi Mfg. Soc. Ltd., 2 MTs., Rs. 4,95,145; From France: The Mysore State Agarbathi Mfrs. Co., 1,000 Kgs., Rs. 1,77,624; From UK: Bush Boake Allen (I) Ltd., 396 Kgs., Rs. 2,18,141.

BROMO CHLOR DIFLUORO METHANE: From UK: Steelage Inds. Ltd., 14,040 Kgs., Rs. 8,78,358.

CHLORO ACETYL CHLORIDE: From Japan: Siris India Ltd., 16 MTs., Rs. 4,07,064.

2-CHLORO PROPIONIC ACID: From Japan: Vorin Labs. Ltd., 15,840 Kgs., Rs. 3,38,956.

CHLORO TRIFLUORO DIBROMO ETHANE: From UK: I.E.L. Ltd., 8,000 Kgs., Rs. 7,49,400.

4-CYANOPYRINE: From Japan: Chandak Laboratories Ltd., 5,000 Kgs., Rs. 3,71,196.

2,6 DIETHYL ANILINE: From Belgium: Siris India Ltd., 27.360 MTs., Rs. 12,35,828.

DIETHYLENE GLYCOL: From Japan: Tushar Enterprises, 24,255 Kgs.,Rs. 2,01,536.

DILTIAZEM HCL: From Hungary: Chemtech Lab Ltd., 6 Kgs., Rs. 21,927.

DIMETHYLAMINO ETHANOL: From FRG: Venkatarama Chemicals Ltd., 5,400 Kgs., Rs. 1,89,718.

DIMETHYL AMINO PROPYL-AMINE: From FRG: SIP Resins Ltd., 1,280 Kgs., Rs. 69,062.

DL METHIONINE: From Japan: Oscar Feeds, 3,000 Kgs., Rs. 1,65,162.

DIPHENYL HYDANTOIN: From Italy: TTK Pharma Ltd., 10 Kgs., Rs. 5,542.

ETHYL MERCAPTAN: From Belgium: Hindustan Petroleum Corpn. Ltd., 1,920 Kgs., Rs. 55,069.

FERRIC OXIDE: From USA: Audio Electronic Co. Pvt. Ltd., 9,979.20 Kgs., Rs. 6,31,284.

FORMIC ACID: From FRG: Namaste Leather Garments Ltd., 4,935 Kgs., Rs. 54,856.

CAXTON

- Mono-Ammonium Phosphate
- Di-Ammonium Phosphate
- Mono-Sodium Phosphate - Crystals
- Mono-Sodium Phosphate - Anhydrous
- Sodium Acid Pyro Phosphate
- Di-Sodium Phosphate - Crystals
- Di-Sodium Phosphate - Anhydrous
- Tetra Sodium Pyro Phosphate
- Tri Sodium Phosphate - Anhydrous
- Mono Calcium Phosphate
- Di-Calcium Phosphate - $2H_2O$/Anhydrous
- Tri-Calcium Phosphate
- Mono Potassium Phosphate
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